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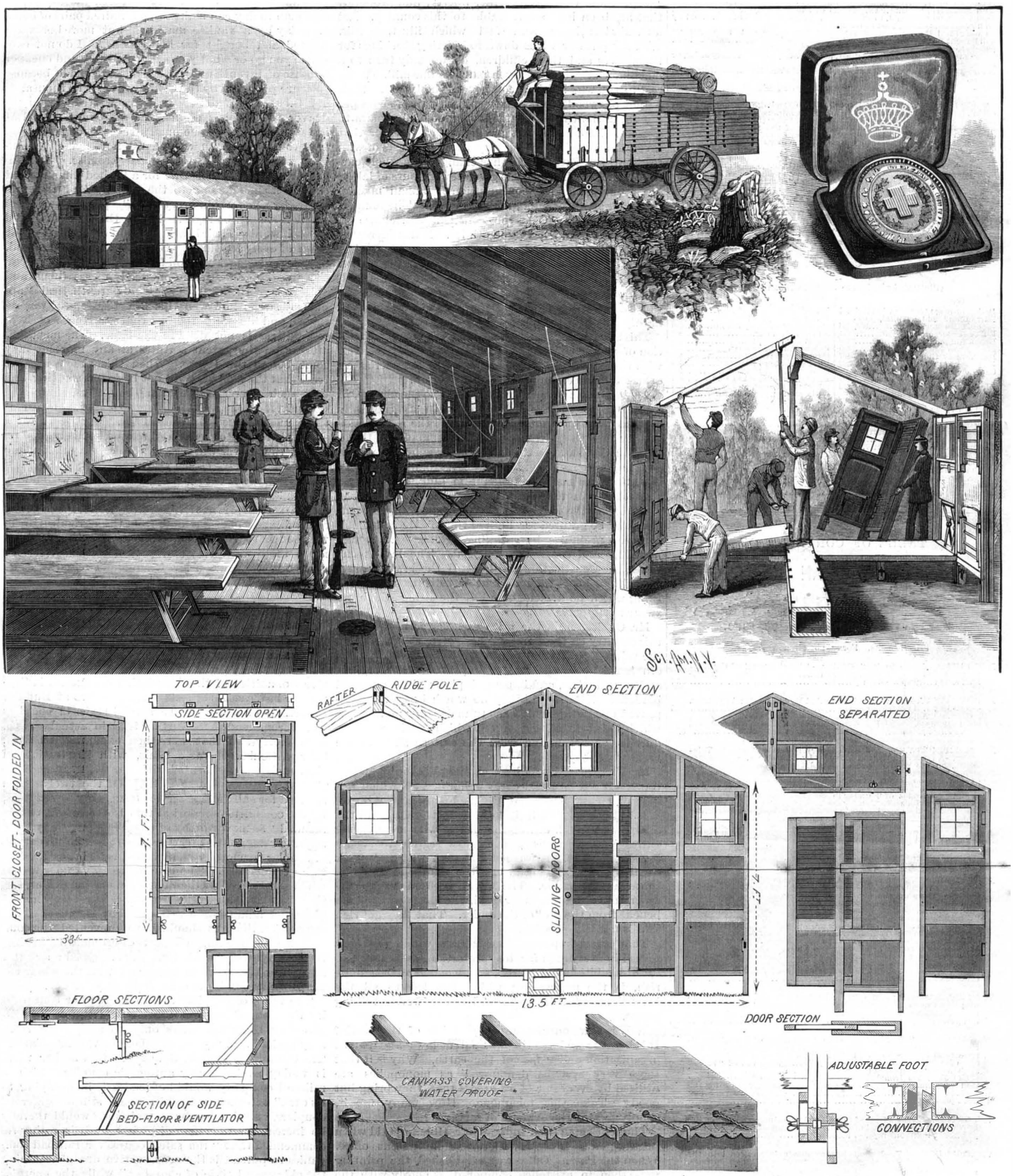
DUCKER'S PORTABLE BARRACK AND FIELD HOSPITAL.

The Society of the Red Cross in Europe has, for several years, given particular attention to the subject of portable field hospitals and other improved appliances for the care of sick and wounded soldiers. Though the more humane method of settling international differences by arbitration is appealing each year with increasing earnestness to the conscience of Christendom, there is still an immense field for the ministrations of those who seek the conservation of life in the midst of its military destroyers. Despite the deadliness of modern instruments of warfare, it is conceded that a greater proportion of soldiers die from lack of sufficient care and from exposure than from the immediate effects of the

(*Continued on page* 404.)



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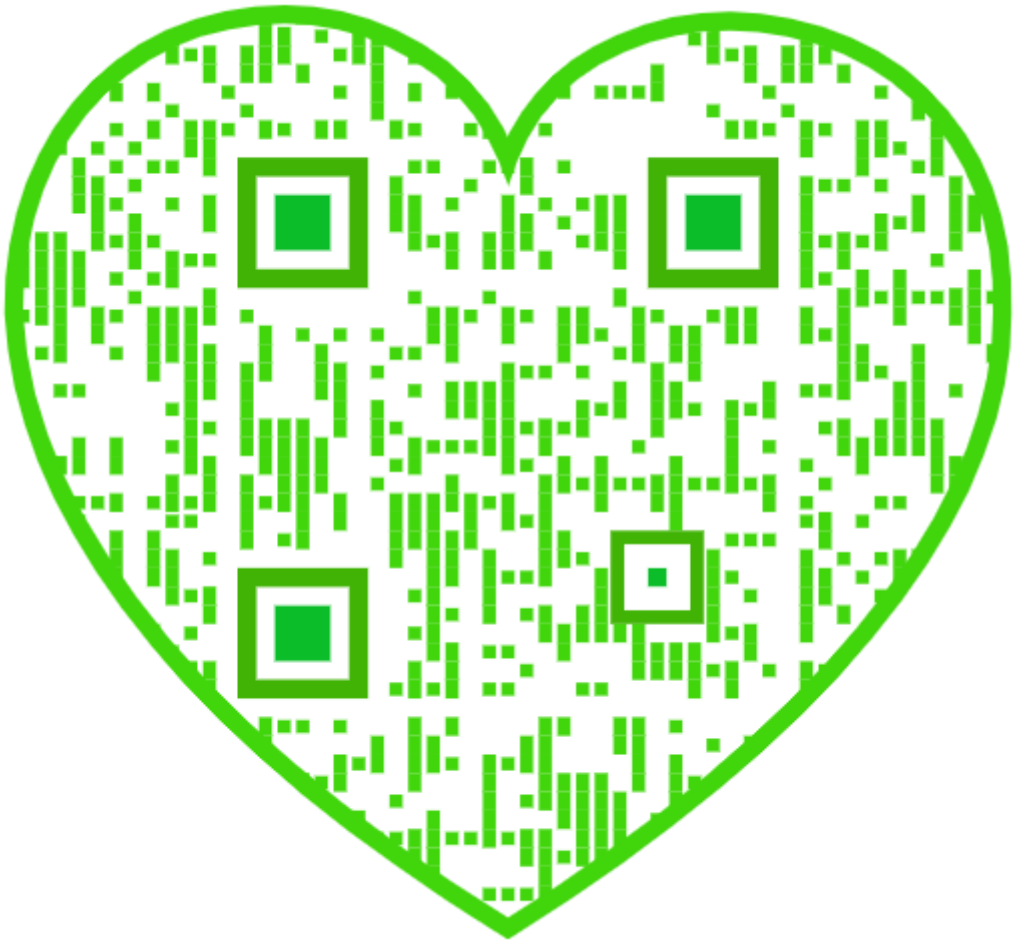

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NEW YORK, SATURDAY, JUNE 26, 1886.

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THE BENEFITS OF THE PATENT LAWS.

In the discussion of the oleomargarine bill in the House of Representatives, effort was made to bring a point against it as being a manufacture based on patents. One member declared that he had a hundred patents before him relating to it. This point was made, it is obvious, to gain the goodwill of the House for the measure, by invoking its dislike of the present patent laws. Extraordinary as such reference appears, it was seriously made. It is most satisfactory to see how it was met. The Hon. Nathaniel J. Hammond, of Georgia, took up the issue, and said in reply, partly to Mr. Holman: "He is hardly driven again to say this bill is against a monopoly patent. He absolutely says that the patent clause of the Constitution is a curse rather than a blessing.

Mr. Holman.—No; not that.

Mr. Hammond.—I cannot argue such a proposition in my limited time. But the history and the experience of this Government will show no other clause, except those that protect life, liberty, and property, that has been half as valuable to this country. Let me call attention to some facts which illustrate this. We may put our wives down to knitting stockings for themselves and their children, or we may turn to a machine that will knit seven pairs for one mill. What rest to the wife! What comfort to the babes! With patent pegwood we peg sixty million pair of shoes per annum in the United States at a cost of five pairs to a cent! Millions of feet are shod that but for that invention would be crippled by the hard frosts of winter. Sir, the Patent Office has changed the whole current of modern life. It has given fewer hours of labor, and to more men less consumption of human muscle, a broader sweep of human mind. . . . The foundation of that change is the constitutional clause on which is based the Patent Office. It has increased wages, it has increased mental strength and physical strength, mental comfort and physical comfort. When gentlemen are driven, in support of this bill, to denounce any part, and especially that part, of the Constitution of the United States, they are indeed hardly driven." [Applause.]

This shows that in Congress there is some recognition of the benefits of those statutes, and interference with them is resented by one leading member as an attack to some extent on the Constitution.

Again Mr. Hammond had to return to the charge, in answer to his former opponent. Just as gracefully and eloquently as before, he defended the patent statutes against the unreasonable attack made on them. He holds Mr. Holman closely to the issue he had raised.

"The gentleman from Indiana [Mr. Holman] got away from the issue made between him and myself as to that clause in the Constitution which declares that 'to promote the progress of science and useful arts, patents may be granted for limited times.' He undertook to raise a prejudice by speaking against 'patent monopolies' and the laws as passed. The law is one thing, the Constitution another. If the law is wrong, it ought to be changed. The Constitution was the thing which he attacked, and is the thing which we swear to support.

Mr. Chairman, in the price of every acre of land in this country on the eastern or western shore, you see the value of the patent rights. What would our Western lands be worth but for improved corn-droppers and corn-shellers, and improved plows, thrashers, and binders? What would they be worth but for the improved machinery which has tunneled our mountains, which has bridged our rivers, which carries our produce to the ocean, and from the eastern shore to the great world beyond?

Mr. Chairman, let us look at the philosophy of this thing. It is a fact that every dollar of gold which was ever dug cost three—not to the man who dug it out. It is but one who finds it, and he gets rich. But the others who are hunting, the others who are wearing out their hands and eyes in fruitless search, are spending their dollars. It was not the man who undertook to find oil in Pittsburg, but the man who struck it, that made a fortune. The world profited by the industry of the searchers for gold, and the world reaps a benefit from the find of the finder. That they got rich affects not the question.

That grand impulse of selfishness which God has placed in every man for his protection, as a stimulus for his ambition and energy, which makes anxiety to be rich, is the mainspring which has led to all the inventions of this world which are worth talking about.

Why is it we outdistance any nation of the earth? It is because we have the best patent laws and patent organization on the face of the earth. Why is it that these very systems denounced as monopolies are utilized by every one of us, except that they bring but good? Take this telephone. How many use it, simply to save the expense of servants?

The gentleman from Indiana [Mr. Holman] said when printing was invented, there was no patent office. When the Patent Office was established, the printing press then in existence compared as poorly with the Hoe power press of to-day as a chip on the ocean compares with the most magnificent steam vessel which floats a flag. [Applause.]

When the gentleman from Pennsylvania was a boy his neighbors, perhaps himself, lived in a cabin, with nothing to hang their coats upon but a peg, and nothing to sit upon but a stool. Under the impulse to inventive talent given by the hope of securing for inventors during a limited time the exclusive benefit to the cogitation of their brains, the homes of the poor and the rich have been made comfortable. And the cottage of the workingman to-day outvies in comforts and luxury the dwellings of the kings of a hundred years ago.

Mr. Chairman, look at the item of wages for a moment. Go back fifty years, and compare the wages then paid with the present rates. Take the history of New England recently published, and compare the wages of a shoemaker of to-day with what they were then. These mechanical improvements have been developed in every department. Yet shoemakers' wages are doubled and in some departments trebled in fifty years. One man to-day can make three hundred pairs of boots each day by a Yankee machine; but more boots are wanted, and bought for little money. I do not care where you go or what you see, it is better and cheaper because of inventions. Inventions are made because they are protected by the Constitution. The thousands and thousands of dollars that are wasted in vain endeavor, the sleepless nights, the toilsome days, all at last crystallized in some man's success, bring a glad fruit to the Patent Office, and ask it to make the contract according to constitutional promise. The inventor says, 'Give me this for a limited time, and at the end it shall belong to the world.' And the world makes by the bargain every time." [Applause.]

The fact must be regretted that there was any need for such words. Their bearing should form a part of the creed of every legislator. But it is, on the other hand, a subject of congratulation for all that when the necessity arose there was some one ready to say them, and able to say them so well. The parenthetical "applause" shows how well this direct statement was received, and illustrates the fact that the House of Representatives is not dead to the issue. The menacing attacks on the patent statutes at any moment may come before the House. When this time comes, we trust that the members will not be found wanting, and that such wrong measures, although urged by the Committee on Patents, will receive speedy death at the hands of the whole assembly. If opposed with such spirit and eloquence as disclosed in the quoted remarks, they never will pass by the majority that a similar measure received some years ago.

This defense of the patent statutes comes with added grace and force from a Southerner. He does not represent a section devoted to invention. But he is ready and willing to offer a tribute from the agriculturists of the South to the inventors of the North, who have made their work easy and profitable to them. We spare our comments of Mr. Hammond's remarks, as we feel that we can add nothing to their force.

CAR BUILDERS PERPLEXED ABOUT CAR COUPLERS.

At the annual convention of the Master Car Builders' Association, which opened at Niagara Falls, June 8, there was quite an excited discussion relative to car couplers. It will be remembered that the Executive Committee of the Association conducted, in September last, a series of tests of car couplers at Buffalo, as a result of which twelve special styles of couplers were recommended for further trial in actual service, out of forty-two that were then experimented with. [For particulars of these trials, with illustrations of the couplers experimented with, see SCIENTIFIC AMERICAN SUPPLEMENT, No. 510.] Of the twelve then selected for subsequent service tests, only seven were, by the committee's report at this last meeting, recommended "as most worthy of trial" in a large way hereafter, to "demonstrate their ultimate worth," five styles of coupler formerly recommended being thus inferentially condemned. The committee gave no reasons, when questioned, for their action in this particular, further than that the service trials were as yet very incomplete, an admission which different members of the convention thought should have prevented the committee from making a report discriminating against the five styles of coupler that were dropped; and this impression seemed to be so general that the whole car coupler question is yet concededly an open one.

The trials of couplers are to be further continued by the committee, but new consideration will be given by these examiners only to such couplers as may be indorsed by five members of the Association. The committee express doubt "as to whether there is to-day available any automatic coupler which a railroad company would be justified in applying to its cars," as other companies would still use different couplers, and the danger to train men would thereby be increased rather than diminished. It is rather recommended that "the safest course for railroad companies to pursue is the conservative one of retaining the old general style of coupling," while the energies of the Association should be devoted to adopting and

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getting into practice "uniformity in style and construction of drawheads and deadwoods."

The report of the committee caused a most animated debate, from which it was plain that the question of obtaining a satisfactory safety car coupler is still one of the most important that railroad men have to deal with. There is not any particular style of coupling that has yet received more than a sort of negative recommendation, but the lines are pretty clearly laid down that new couplers shall be calculated to couple readily with such other styles as are at present in most general use. The field for further competition is therefore still wide open, and inventors are urgently invited to occupy it until they succeed in working out the difficult problem, and constructing a device which will command approval. The demand for such improvement is now felt to be the more urgent, inasmuch as New York State requires an approved safety coupler on all cars built after July 1, while in Massachusetts and Michigan similar laws are already in operation, and public opinion seems to insist upon such legislation in most of the other States. The master car builders and the railroads would be only too happy to comply with such laws, if they could find a coupler which would adequately answer the practical requirements of the railway business of the country; but until they are satisfied that such a style of coupler has been found, the Association think a waiting policy is the best one for the companies, in the hope that American inventive genius will yet furnish a satisfactory way out of their difficulties.

A TRANSCONTINENTAL BALLOON VOYAGE.

The largest balloon in the world, according to the San Francisco *Chronicle*, has recently been built in that city by Mr. A. P. Van Tassel. It has a capacity of 150,000 cubic feet of gas, and has been constructed for the special purpose of enabling the well known aeronaut to undertake a journey across the continent, from ocean to ocean. The height from the floor of the wicker car to the top of the gas reservoir is 119 feet, and of the dilated reservoir alone 68 feet. The envelope is made of finely woven cloth, manufactured expressly for the purpose, and is varnished, as usual, in order to make it gas tight. The car has accommodation for fifteen persons. It is about twenty-one feet in circumference, and the sides are thirty-four inches high. The supporting ropes are kept in place by the usual "concentrics." Hydrogen gas will be used for inflating the balloon. The cost of the structure is stated to be $6,000. Mr. Van Tassel has had considerable experience in aerial traveling, having crossed the Wichita Mountains, 15,000 feet above sea level. His present attempt is more ambitious than any he has yet made. A careful study of the aerial currents leads him to believe that by seeking the proper stratum of air he can be carried eastward at high speed, possibly 100 miles an hour. The greatest difficulty will probably be due to the Rocky Mountains, which modify the movements of the air currents over a large area of the continent. It is expected that the voyage will be begun some time about the 1st of July. Should it survive the trip, the giant balloon will be taken back to San Francisco, where it will be placed on exhibition.

ELECTRIC LIGHTING AS AN INVESTMENT.

With a view to put at rest the question whether local electric lighting companies are profitable investments, we have recently addressed a circularletter to the general managers of a number of such companies, both East and West, asking for their experience in the matter. We have directed our inquiry in this instance particularly to those operating the Thomson-Houston system.

We have received answers from all parts of the country, and the general tenor of the replies is that many of their local companies are earning better dividends than are yielded by the majority of other new enterprises. The question of profit rests first with the locality, and then, if this be judiciously chosen, with the system employed and the ability displayed in the management.

Of those who have stated the exact profits of their investment, we believe the highest returns came from Omaha, Nebraska, where a company, operating four 30 light dynamos, had earned at the end of the first three months after incorporation 4½ per cent on the investment, or at the rate of 18 per cent per annum. Two more dynamos of the same capacity have since been added to their plant. The gentlemen connected with this company are so well pleased with these results that they procured a franchise for operating in Des Moines, Iowa. They began by running 65 arc lamps, but have since increased their plant.

Replies have also been received from Washington, St. Louis, Worcester, Terre Haute, Auburn, Me., Salem, Mass., Quincy, Ill., Kansas City, etc., which confirm these results, and state emphatically the belief of the writers in the desirability of electric lighting as an investment.

These conclusions, although derived from the working of the particular lighting system we have named, may be equally valid and reliable for other systems now before the public, although we are advised that a greater number of local companies are operating their system than any other, and we find these companies uniformly successful so far as our inquiries have extended. There is room for great extensions of these local lighting companies in all parts of this and foreign countries.

PHOTOGRAPHIC NOTES.

Chlorophyl and Eosin Orthochromatic Plates.—In a communication to the Franklin Institute, which we take from the *Brit. Jour. of Photography*, Mr. Fred. E. Ives, of Philadelphia, Pa., relates some interesting experiments recently made on the combination of chlorophyl and eosin, as follows:

The subject of color sensitive photographic processes has received a great deal of attention during the past year or two, but there has been, and is still, a great diversity of opinion in regard to the capabilities of the various color sensitizers. In illustration of this fact I will mention that Becquerel, who first tried chlorophyl, stated that with it he made plates from one-fifth to one-tenth as sensitive to the red of the spectrum as to the blue or violet. Dr. Vogel estimated that eosin-stained plates were eight times more sensitive to the yellow-green of the spectrum than to the blue. I myself stated that plates stained with myrtle-chlorophyl, according to my published method, required even less exposure through a yellow glass than eosin plates. Captain Abney stated that, according to his experience, stained plates were always many times more sensitive to blue and violet than to any other color; and many persons have believed that the color sensitizers acted more by reducing the blue and violet sensitiveness than by actually increasing the sensitiveness to other colors.

For the purpose of proving the capabilities of chlorophyl and eosin, I have made four photographs of the lime light spectrum, one on a plain emulsion plate, one on a chlorophyl-stained plate, one on an eosin-stained plate, and one on a plate stained with both chlorophyl and eosin. The spectrum was projected by means of an optical lantern and a flint glass prism, with a slit measuring one-fiftieth of an inch. It will be understood that the different colors have not exactly the same relative intensity in this spectrum that they have in the solar spectrum, but the difference is insignificant. Short wires were placed so as to cast shadows on the sensitive plate, to aid in the comparison of results. Some of these wires, which I have marked, occupy the position of Fraunhofer lines in the solar spectrum. All plates were prepared with the same collodio-bromide emulsion, and received the same exposure and development.

The plain emulsion plate shows very little action, except in the blue, violet, and ultra-violet; the maximum of sensitiveness is in the middle of the violet. (It should be noted here that with gelatino-bromide dry plates the maximum of sensitiveness is in the indigo blue, about G, and they are also relatively more sensitive to green and yellow.)

The chlorophyl plate shows a very strong action all through the visible spectrum—strongest in the red, orange, and dark green; weaker in the blue and violet; and weakest in the yellow-green. In the red, below C, the plate shows about five times as much sensitiveness as in any part of the violet; in the orange red, twice as much; in the yellow-green, one-half as much; and in the dark green, one and a half times as much. The violet sensitiveness appears to be slightly reduced near H. This experiment proves that my chlorophyl plates are remarkably sensitive to all colors, as I have many times asserted that they were, and that they are twenty-five to fifty times more color sensitive than those which Becquerel employed in his experiments. They are probably 400 or 500 times more sensitive to red than unstained plates.

The eosin plate shows no action in the red and orange, very little in the yellow, a great deal in the yellow-green, and considerable in the dark green. The action of eosin is strongest exactly where the action of chlorophyl is weakest; it gives about the same degree of sensitiveness to yellow-green that chlorophyl gives to red, but in a broader band. The violet sensitiveness appears to be exactly the same as in an unstained plate.

The chlorophyl-eosin plate shows by far the most remarkable result of all. Neither sensitizer appears to have retarded the action of the other, but rather to have aided it, so that *the weakest portion of this photograph below F is stronger than the strongest portion in the blue and violet!* Nearly a year ago I recommended that chlorophyl and eosin be used together in practical isochromatic photography, and this experiment proves that the combination possesses the advantages which I claimed for it.

I have found that, in order to secure the best results with the chlorophyl-eosin process, fresh, strong, blue-myrtle chlorophyl solution must be used, and the amount of eosin must be strictly limited, otherwise, the plate will not be so sensitive to yellow and to blue-green. I now prefer to apply the eosin by simply tinting it with water in which the plate is to be washed, after applying a plain solution of chlorophyl. I have an over-exposed negative of a bright chrome card, which I made on one of these chlorophyl-eosin plates, with an exposure of one minute in the light of a coal oil lamp having a single small Argand burner and nickel reflector. No color screen was used, but, owing to the yellowness of the coal oil flame, all the colors have photographed correctly. An unstained plate, with same exposure and development, showed only the high lights of the picture very faintly.

The Law as to Party Walls.

A party wall in law is the wall dividing lands of different proprietors, used in common for the support of structures on both sides. At common law an owner who erects a wall for his own buildings which is capable of being used by an adjoining proprietor, cannot compel such proprietor, when he shall build next to it, to pay for any portion of the cost of such wall. On the other hand, the adjoining proprietor has no right to make any use of such wall without consent of the owner, and the consequence may be the erection of two walls side by side, when one would answer all purposes. This convenience is often secured by an agreement to erect a wall for common use, one-half on each other's land, the parties to divide the expense; if only one is to build at the time, he gets a return from the other party of half what it costs him. Under such an agreement, each has an easement in the land of the other while the wall stands, and this accompanies the title in sales and descent. But if the wall is destroyed by decay or accident, the easement is gone, unless by a deed such contingency is provided for. Repairs to party walls are to be borne equally; but if one has occasion to strengthen or improve them for a more extensive building than was at first contemplated, he cannot compel the other to divide the expense with him. In some States there are statutes regulating the rights in party walls, and one may undoubtedly acquire rights by prescription on a wall built by another, which he has long been allowed to use for the support of his own structure.—*Building.*

Mineral Ultramarine.

J. R. Jackson, F.R.S.—The preparation of ultramarine is as follows: The pieces of lazulite the most rich in color are picked out, they are washed, and then plunged into vinegar, and if the color does not change, the quality is esteemed good. The stones are then again repeatedly heated, and plunged each time into vinegar. By this means they are easily reduced to an impalpable powder. This is then well worked up into a paste with resin, white wax, and linseed oil, to which some add Burgundy pitch. The paste is then put into a linen bag and kneaded under water, which at first assumes a grayish color, resulting from the impurities that are first separated from the mass. This water is thrown away and replaced by fresh, and the kneading recommenced, when the water becomes of a fine blue. This is poured off and allowed to settle, the precipitate being ultramarine of the finest quality. The repetition of the process furnishes color of inferior quality in succession, and finally the residuum, being melted with oil and kneaded in water containing a little soda or potash, yields what is termed ultramarine ashes. The inalterability of ultramarine is a most valuable quality; but this very property is injurious to the effect of old paintings, for while the other colors have changed, this, preserving its original brilliancy, all harmony is destroyed, as may be observed in many old paintings and frescoes.

Convention of Civil Engineers.

The Annual Convention of the American Society of Civil Engineers will be held at Denver, Colorado, on July 2, 3, and 5. Sessions for professional discussion, and one for the transaction of business, will occupy the three days. At the close of the Convention, several railway excursions will be made to a number of points of engineering interest in Colorado. These excursions have not yet been fully arranged, but will probably include Greeley and the extensive irrigation works in its vicinity, Georgetown, Leadville, Gunnison, and Pueblo. It is proposed that they shall terminate at Colorado Springs, where the engineers will separate for their respective homes. A large attendance is anticipated, and in consequence very favorable transportation rates have been secured. Mr. Henry Flad, the President of the Society, will deliver the annual address during one of the sessions of the Convention.

DAVID VAN NOSTRAND, a well known New York publisher and importer of scientific books, died June 14, in the 75th year of his age. He was first employed in a city bookstore when 15 years old, and subsequently became acquainted with many military and scientific men, who gave him orders for books, relying upon his good judgment for their selection. He thus, as well as from the natural bent of his tastes, developed a business especially in the line of military and scientific books, his military publications during the war of 1860–65 having been numerous.

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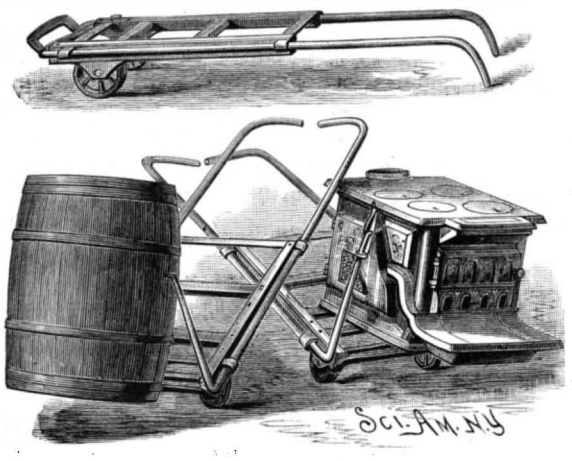
Generating Steam by Slag.

Mr. Brotherton, Superintendent of the American Smelter, at Leadville, Col., has patented a plan for generating steam for motive power at the smelters through the use of slag. By this method the slag is dumped into large shallow vessels, which are afterward run under boilers, and the heat used in generating steam. An experimental test of the method resulted in maintaining 75 pounds pressure on a vertical boiler for seven days. If the plan proves practical, it will result in a saving to the smelter of $1,200 to $1,500 a month.

IMPROVED HAND TRUCK.

In eyes secured to the side edges of the platform, which is mounted on wheels in the usual way, are journaled rods extending beyond the lower end of the platform. The outer parts of the rods are bent at right angles to form arms, and the extremities are bent inward and pointed, to engage with the article to be carried, as shown in the left of the cut. The other ends of the rods are bent toward each other, forming arms, which serve as levers for turning the rods to move the lower arms toward each other. The upper and lower arms are bent in planes approximately at right angles with each other; when not to be used, the lower arms are folded one over the other upon the edge of the truck, which can then be used in the ordinary way. When a stove or similar article is to be handled, small attachments are slipped over the grip points, when the stove can be easily carried, whether it be on its legs or not, by one man, who



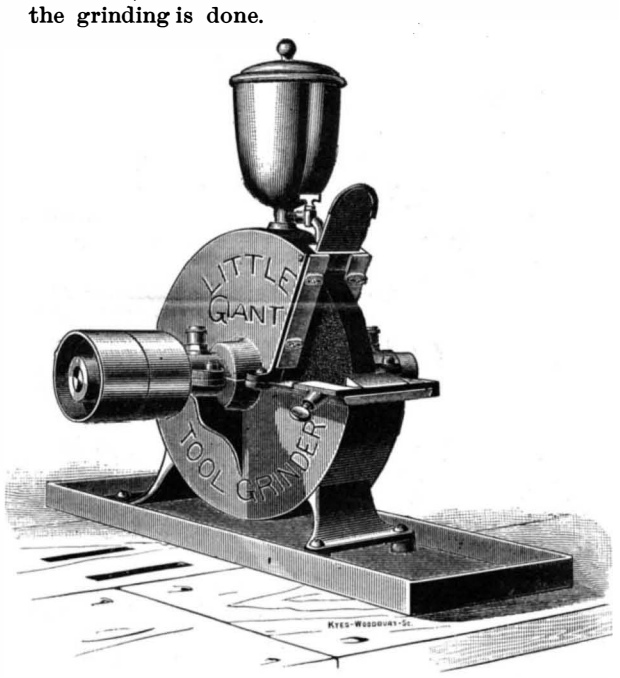
SMITH'S IMPROVED HAND TRUCK.

need not touch it with his hands. This feature makes the truck particularly valuable in handling such articles as spools of barbed wire.

This invention has been patented by Mr. Charles W. Smith, of Belmond, Iowa.

IMPROVED TOOL GRINDER.

The accompanying engraving represents an improved machine for sharpening machinists' tools of all kinds. The corundum wheel, the grade of which varies to suit the kind of work to be done, runs in water, thereby avoiding all danger of drawing the temper from hardened tools. A wheel made of this material cuts faster than the ordinary grindstone, is more accurate, and much cleaner. This grinder occupies a space only 12 by 22 inches. No water flies from the wheel, as it is covered with a hood, except where the grinding is done.

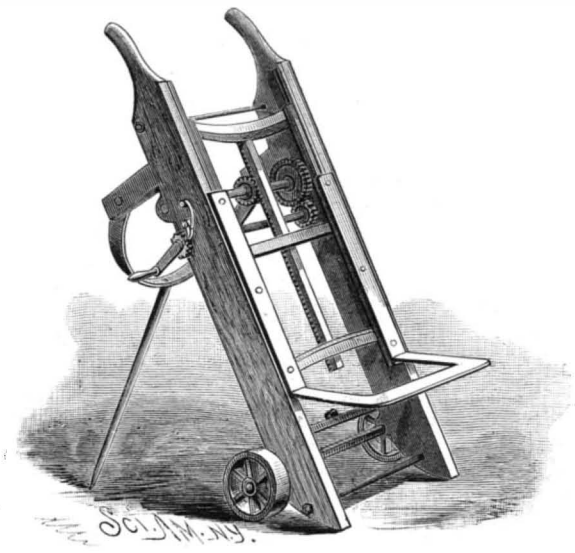


THE LITTLE GIANT TOOL GRINDER.

The manufacturers of this grinder—the New York Supply Company (limited), of 50 and 52 John Street, New York city—have adopted a special corundum wheel, which, by reason of its porous nature, is constantly moist, and, in consequence, all danger of drawing the temper of the tools is obviated.

A NEW HAND TRUCK.

The hand truck here illustrated is so constructed that it can be used as an elevator for loading boxes, sacks, and other heavy articles into wagons. In the inner sides of the upper part of the frame are formed



CALDWELL'S NEW HAND TRUCK.

grooves, in which slide bars of a frame, to the lower part of which are attached plates that overlap the side bars of the main frame. A toe is formed at the lower end of the plates. To the centers of the cross bars of the sliding frame is secured a rack bar, the teeth of which mesh with a pinion on a shaft driven by gearing operated by a crank handle at the side of the main frame. By properly turning the handle, the frame and its load can be raised, a pawl and ratchet wheel preventing the gearing from turning back. To the legs of the frame is hinged the forked upper end of a long leg, upon which the truck is supported when raised into an inclined position, so that the crank can be conveniently operated to raise the frame and load. When the load has been raised to the required height, it is held in place by the pawl, and can be placed in the wagon by swinging the upper part of the truck forward upon the toe as a fulcrum. When not in use, the leg is held against the under side of the truck by a spring clamp.

This invention has been patented by Mr. John Caldwell, P. O. box 87, Wilmington, Del.

Woolen as a Sanitary Measure.

A new philosophy of clothes is announced to the world under the title of Dr. Jaeger's Sanitary Woolen System, which seems already, after a trial of only four years, to have taken a strong hold upon many of the people of England and Germany, where the manufacture of the woolen fabrics and garments is conducted, subject to the scrupulous inspection of Dr. Jaeger himself, and conformably to his discoveries and theories respecting it as a cure and preventive of disease.

His claims in its behalf are broad and sweeping, and apparently extravagant. Nevertheless, his doctrine is rapidly gaining converts in both countries. The *London Times* speaks of it as having been adopted by some of "our most eminent sanitary reformers, while in Germany it has not only revolutionized the trade of Stuttgart, where its founder practices, but the clothes are worn and highly appreciated by such men as Count Von Moltke, who may be expected to apply the principles in question to the German army."

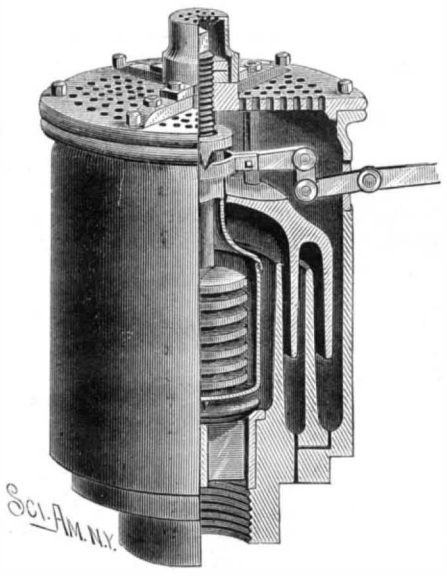
Everybody knows that almost everybody is the victim of some kind of ailment or infirmity; but hardly anybody would have suspected, till Dr. Jaeger revealed the results of his investigations and discoveries, that many of the ills that flesh is heir to are the effects of the "material and form of the ordinary clothing of the present day." But this is precisely what Dr. Jaeger claims to have proved, while he professes to have found a very general, though by no means a universal, remedy. It lies in the renunciation "*of all material of vegetable fiber* (linen or cotton) *or silk* in clothing and bedding," and the substitution "of clothing and bedding of *animal wool throughout*, so constructed as to afford to the body the *maximum* of protection from chill and damp, with the *minimum* of impediment to the escape of the exhalations from the skin."

He rests his theory chiefly on the well known properties of wool, which make it a poor conductor of heat, while it is highly permeable and transmissive to the exhalations of the skin. The London *Lancet* calls this the "rallying point" of his system, and the *Sanitary Record* (London, Feb. 15, 1884), says: "The underclothing has been extensively worn since its introduction, and has received a general consensus of approval on its intrinsic merits."

Any one curious to see these novel articles of clothing, from a collar to an overcoat, from a shoe to a necktie, and from chemise to shawl, will soon have an opportunity afforded them at 827–829 Broadway, where a large exhibition and salesroom is soon to be opened by the "Dr. Jaeger Sanitary Woolen System Co."

MUFFLER FOR STEAM VALVES.

This muffler, the invention of Mr. Thomas E. Hill, of Rahway, N. J., is for deadening or preventing the unpleasant hissing sound of escaping steam from the valves of steam engines. The main casting is formed with an outer circular casing and with inner upwardly projecting concentric flanges, which form annular chambers and a central circular chamber, the bottom of which is formed by a valve fitted in an opening in the casting. This valve is held to its seat against the pressure of steam by a spring arranged in a box that may be lifted against the pressure of the spring by suitable levers. The pressure of the spring upon the valve can be adjusted by means of a bolt, the upper end of which screws into the center of the top plate, and the lower end of which bears against a plate resting on top of the spring. It will be seen that by turning this bolt, which passes loosely through the upper or neck portion of the box inclosing the spring, the latter can be made to exert more or less pressure upon the valve. Held within the casing is a deflector formed with two downwardly projecting concentric flanges, which enter the annular chambers formed in the casting. This construction compels the steam escaping from the valve to take a circuitous course through the chambers, in which it is diffused and its pressure reduced; it finally issues in



HILL'S MUFFLER FOR STEAM VALVES.

many small jets from the numerous holes formed in the top plate.

FEEDING STAND FOR POULTRY.

The side, end, and center frames of the feeding stand are provided with rods in their panels, which are separated sufficiently from each other to allow the fowls to gain access to the feed. One-half of the roof is fixed, while the boards forming the other are hinged and provided with arms for limiting their motion when opened. In one compartment of the stand is a hopper, having openings in the bottom, which can be closed by a valve operated by a hand lever, pivoted to the frame as shown, or opened to allow the feed to escape. Below the hopper is placed a bar so shaped as to divide the grain entering from the hopper into the feed trough. In the other compartment is placed a metallic water trough, between which and the end of the compartment is formed a receptacle for soft feed. The grain from the hopper flows into the compartment, and is spread evenly on all sides by the bar; the flow of the grain is checked by the partial filling of the feed trough. As the grain is consumed, its place is supplied

McDONALD'S FEEDING STAND FOR POULTRY.

by fresh grain from the hopper, and in this manner a continuous supply is maintained in the trough, and the fowls are prevented from scattering or wasting the feed.

This invention has been patented by Mr. Samuel McDonald, of Cochran's Mills, Pa.

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NEW POWER PUNCHING PRESSES.

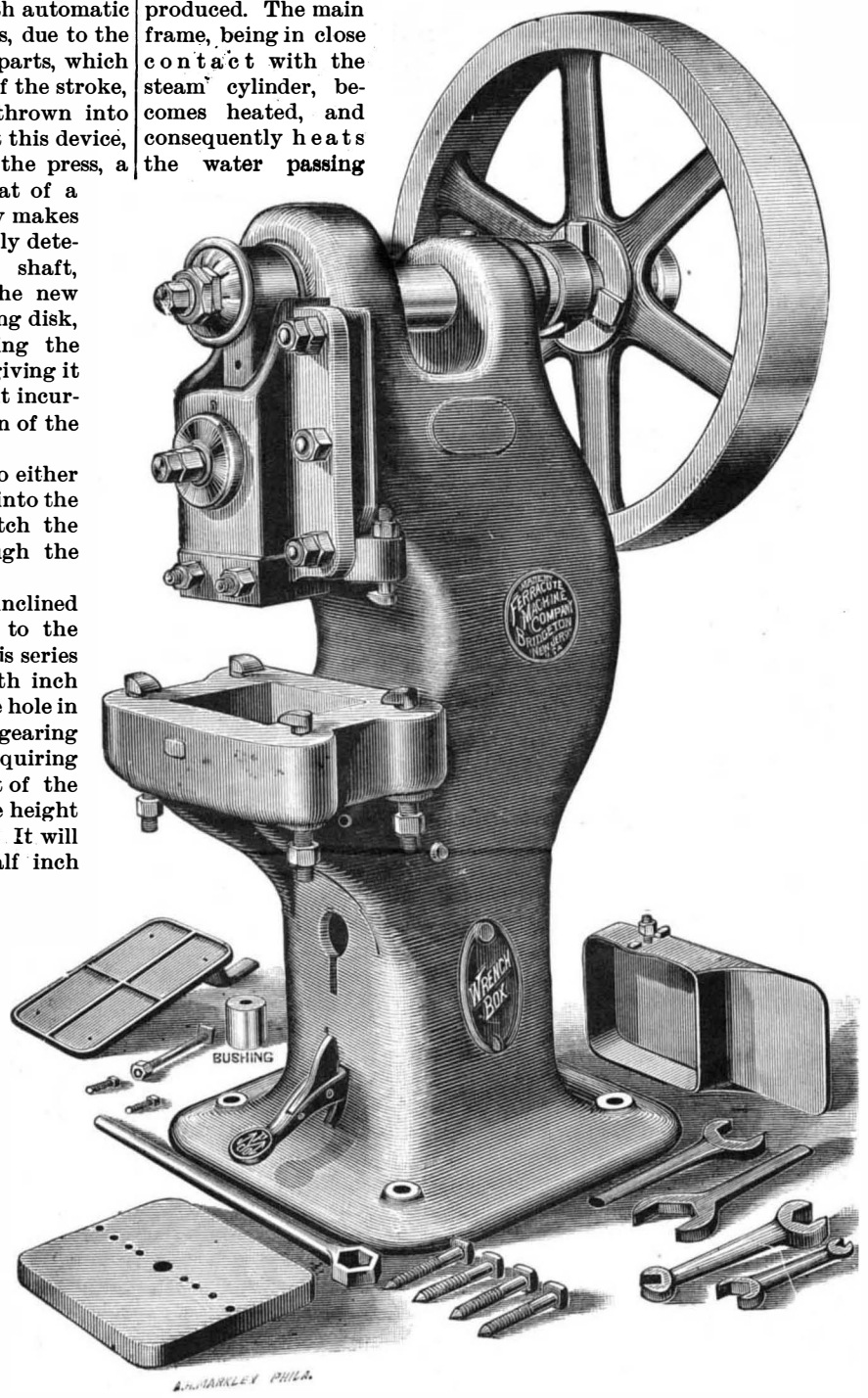
The press illustrated herewith represents one of a series of improved punching presses which have just been put on the market by the Ferracute Machine Co., of Bridgeton, N. J. These presses are especially adapted for cutting, punching, and forming heavy metals in the manufacture of such articles as nuts and washers, hardware, drop forgings, etc. The frame is cast in the form of a square tubular column, with massive internal ribs, and widening out into a well extended base. The general design is such as to give the most strength and to permit of the most convenient handling of the dies and material. The heavy forged steel crank shaft extends from the front to the back, and is arranged with a special view to making it easy to attach cams for working automatic devices. The front end of the crank pin is arranged with a view to the same purpose. The wide slide bar is of dovetail section, extends up to the shaft, and, having great length of bearing, gives firmness and accuracy in the working of dies. The gib for the slide bar is clamped fast to a flat face, so that it cannot work loose, and is provided with a new eccentric adjustment for taking up wear, instead of the usual set screws.

A simple and durable automatic clutch is so arranged that the shaft cannot make more than one revolution by one action of the treadle. It consists of a sliding wedge, which causes a pin to enter one of the holes in the steel part of the fly wheel hub. The fly wheel of course runs loose on the shaft, when out of action. There being four holes (or more in the geared presses) on the wheel, the operator never has to wait more than one-fourth of a revolution for the press to start, and the time thus saved is considerable in fast-running presses. This clutch is provided also with a "safety pin" to lock it, allowing the shaft to be revolved to any position, and the dies adjusted, while the fly wheel is in motion, thus dispensing with the need of a countershaft. The sliding wedge of the clutch is so arranged that it can be made to stop the shaft at the exact point required, without the use of a friction brake.

By means of a treadle lock, operated in either direction with the foot, the treadle can be fastened down for continuous running. The die clamps consist of hook-headed steel bolts, sliding in long true holes, which firmly hold the dies without the need of removing nuts, etc. A new spring fly wheel obviates the great difficulty heretofore experienced with automatic clutches, especially in large heavy presses, due to the inertia of the shaft, pitman, and other parts, which stop when the slide bar reaches the top of the stroke, but which have to be instantaneously thrown into gear when the clutch is tripped. Without this device, the result has been, at each starting of the press, a heavy blow, equal in many cases to that of a sledge upon an anvil. This blow not only makes a very unpleasant noise and jar, but rapidly deteriorates the various parts of the wheel, shaft, and clutch which receive the impact. The new spring wheel is furnished with a yielding disk, which starts the shaft gradually, making the press run more easily and quietly, and giving it capacity for a much higher speed, without incurring the evils due to a violent percussion of the parts, and the consequent noise.

The shelf shown in cut may be bolted to either side of the press, and the pan can be slid into the opening in the front of the base, to catch the punchings or such articles as drop through the dies.

It may also be reversed, and used as an inclined chute to catch work and slide it over to the left of the press. The smallest press in this series will cut an inch round hole in one-eighth inch iron, while the largest will cut the same size hole in one inch iron. They are so arranged that gearing can be added to adapt them to work requiring slow motion and great power. The weight of the press illustrated is 3,000 pounds, and the height from floor to top of fly wheel is 75 inches. It will easily punch a one inch hole through half inch iron.



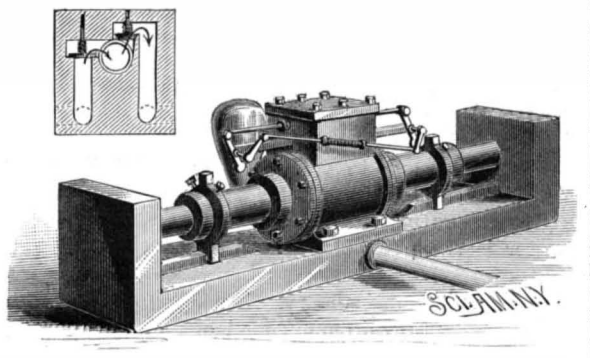
NEW POWER PUNCHING PRESS.

The Wax Process for Engraving.

By means of the new and ingenious little instrument known as the hyalolyphotype, or hot pen, drawings can be made on glass or glassy substances with a waxy composition, which is solid and somewhat hard at ordinary temperatures. The pen is so contrived that it can be heated by either gas or an electric current, and the waxy material flows easily from the heated pen, setting so quickly on the glass that cross hatching can be done more rapidly than with ordinary pen and ink, without risk of blocking up the angles; corrections, too, can be made with the greatest ease by means of a penknife, which leaves the surface afterward intact. After the drawing has been made, the plate is etched by fluoric acid, and when complete it can be either electrotyped, stereotyped, used direct, or applied to any purpose for which engraved surfaces are required.

BOILER FEEDER.

The steam cylinder is secured in the middle of the base plate, and has the usual slide valve and piston, the latter being provided on each side with a hollow plunger which projects beyond the cylinder and is provided at its outer end with a cap. Near each cap is an adjustable ring, having a downwardly projecting forked lug sliding on a raised guide secured to the base. Into



McGEHEE'S BOILER FEEDER.

each of the hollow plungers projects a cylinder, held at one end in the end plate, in which it communicates with the inlet and outlet valve, as shown in the sectional view. The inlet valves at each end lead to a channel in the base, in the center of which the inlet pipe is held; and the outlet valves lead to a similar channel in the opposite side of the base, communicating with the discharge pipe, which is provided with an air chamber and check valve. The slide valve is so arranged as to be operated at each stroke by one of the rings secured to the ends of the plunger.

The piston moves forward and backward, and imparts a reciprocating motion to the plungers, which slide over the stationary cylinders. This action draws water into the cylinders through the inlet valves and their channel, and discharges it on the return stroke through the outlet valves and their channel into the boiler. The machine being double acting, a constant flow of feed water is produced. The main frame, being in close contact with the steam cylinder, becomes heated, and consequently heats the water passing through it. This invention has been patented by Mr. C. K. McGehee, of Liberty, Miss.

Steel Wire Gun.

The *Times* states that the new experimental 9·2 in. wire gun has just been tried at the Government proof butts, Woolwich Arsenal, with satisfactory results. The War Department have issued orders for the construction of several more guns of the same description. The Government pressure test for the gun was 65 tons to the square inch. The new weapon weighs 25 tons, and is 33 ft. long. The steel wire is coiled round the inner tube at the breech and nearly up to the trunnions, and consists of 78 layers. The wire is made in lengths of 2,400 yards, and weighs 20 lb. to the yard. It is flat, and put on by a specially designed machine at a pressure of about 40 tons to the square inch. The lengths are joined together by being brazed and riveted over a considerable length. After the wire has been put on, a steel jacket is shrunk on over it.

Fireproofing and Preserving Compound.

BY NOTZ & KONRAD.

A solution is made of 10 kil. sulphate of ammonia, 1 kil. carbonate of ammonia, ½ kil. borax, 100 grm. bichloride of mercury in 30 lit. of water.

To which solution the extract of 2 kil. peppermint is added, which is obtained by hot maceration of the herb in 6 lit. water; then 150 grm. phenic acid are added, and lastly 6 kil. tungstate of soda diluted with 94 lit. water, in order to prevent the formation of crystals of the various salts and to maintain the fluidity of the chloride of lime which is formed. The whole is vigorously stirred, and heated to 70° C. At the same time, the communication is opened with a retort in which 1 kil. Peruvian balsam and 300 grm. camphor are distilled off in 2 kil. ether, and the distillate stirred in with the above mass. The tissues impregnated with the composition are rendered incombustible, imputrescible, and are never attacked by insects, worms, etc.—*Mon. d. l. Teint.*

Transporting Natural Gas.

Colonel Thomas P. Roberts, of Pittsburg, Pa., obtained a patent for a process of transporting natural gas long distances, which he is confident overcomes all the difficulties resulting from friction and consequent loss of pressure. He proposes, instead of forcing the gas, to draw it at low pressure through large conduits by means of exhaust fans at distances varying from ten to forty miles, according to the character of the ground to be traversed. These fans, which would be boxed into the conduit, would be about sixteen feet in diameter, and would be driven by engines of about twenty horse power. They would only revolve at the rate of from thirty to fifty times a minute—a slow rate as compared with the 2,000 revolutions a minute made by blast engine fans. The pipes would be made of sheet iron, about five feet in diameter.

The patent provides for an alternative method. This is to lay a second pipe under the other one when ascending a hill. This pipe is to be perforated with burners, the heat from which will rarefy the gas. At the top of the hill a tank of water will be placed, from which a pipe would be laid over the gas pipe on the descent of the hill. This pipe also will be perforated to discharge a spray over the gas pipe, thus causing a condensation of the gas. This system will cause the main to act as a siphon, and will maintain an even flow over the hill.

The main feature of this process is that the gas is allowed to flow at about or a little below nominal pressure, and that thus the friction of the gas is reduced to almost nothing. The velocity of the gas would under this system, Colonel Roberts estimates, be not quite ten miles an hour, and the force required would be a small fraction of an ounce per square inch. The only leakage to be provided for would be the air trying to get into the pipe, and paint, Colonel Roberts says, would be ample to prevent this. The estimated cost of this method of transportation, including fans, pipes, right of way, etc., would be about $3, and it would supply three million cubic feet of gas per hour.—*The Coal Trade Journal.*

THE greatest length of Lake Michigan is 300 miles; its greatest breadth, 108 miles; mean depth, 690 feet; elevation, 506 feet; area, 23,000 square miles.

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DUCKER'S PORTABLE BARRACK AND FIELD HOSPITAL.

(*Continued from first page.*)

bullets of the enemy. There is, therefore, every inducement to reduce this unnecessary fatality by providing proper shelter and treatment for both the wounded and the strong. With the charitable purpose of lessening these dangers, an exhibition was held at Antwerp on the 1st of September, 1885, under the auspices of the Society of the Red Cross, and the inventors of the world were invited to contribute the products of their ingenuity. The object of the exhibition was to develop the best possible design for a barrack or field hospital, which might be utilized either in war or in time of peace. The requirements of the proposed structure were as follows:

"The barrack should be capable of being easily converted into a hospital, and *vice versa;* it should be so constructed that it could be set up and taken down with ease, transported without difficulty, and, as far as possible, interchangeable in all its respective parts, and should be able to resist the varying temperatures and withstand the violence of the wind; it should be waterproof, and so simple in its construction that no skilled workmen would be necessary in its manipulation."

A circular containing these requirements having come into the possession of Mr. Wm. M. Ducker, of Brooklyn, he addressed himself to the solution of the problem, and in a short time produced a structure in accordance with the specifications of the society. He forwarded a full sized model to Antwerp, where it was placed on exhibition, in competition with seventy-six other designs from all parts of the world. Mr. Ducker's model attracted much attention, and was very favorably commented upon by the medical and military gentlemen acting as judges. It is a representative American invention, for it combines in an eminent degree lightness and portability with strength and convenience. In recognition of his valuable services in the interests of humanity, Mr. Ducker received a silver medal, contributed by the Empress of Germany, and has also been honored by a message from the Emperor congratulating him upon the excellence of his design. He is now in correspondence with several European governments, with reference to the adoption of his "baraque" in their respective countries.

The merits of Mr. Ducker's design lie in the care with which all the details have been worked out, for, apparently, no condition has remained unsatisfied.

We show in our illustration an exterior view of the baraque, as set up for use, its appearance when loaded on a truck ready for transportation, the medal awarded by the Empress, the interior of the baraque when used as a hospital, the manner of erecting the structure, and the details of its construction. The main building is 34 ft. long and 17 ft. wide. The height is 10 ft. 3 in. at the ridge pole, and 6 ft. 6 in. at sides. It is built in sections, for convenience in transportation, and can be put up without the use of nails or screws. Two men can erect the baraque without the least difficulty, and in little more than an hour's time, as all the parts lock into each other and are perfectly interchangeable. Each side consists of six double sections. These are made of strong, light frameworks of wood, hinged together, and covered on the outside with leather board or other light, waterproof material.

To each double section there are attached, as shown, a bed, table, and chair, while in the panel over the table there are a glass window sash, opening inwardly, and a slatted shutter opening outwardly. During transportation the hinged section is shut together, inclosing these several articles and protecting them from damage. The end of the baraque is also made in sections. The ridge pole is divisible into two or three parts, and is provided with suitable slots, into which the rafters are keyed. When the structure is set up, a standard army duck roof extends over all. The floor is made in similar sections, which key into the sides and into a central longitudinal shaft. The floor being 8 inches above the ground, all dampness is avoided. The central shaft is provided with three registers, and may be used either for hot or cold air, or for disinfectants. Ordinary inequalities in the ground are provided for by adjustable feet attached to the side sections and to the floor. In addition to the main structure, there is a small annex at each end, to be used for heating and other purposes.

Each baraque, it will be seen, thus gives sleeping accommodation for twelve men. Every provision has been made for the comfort of the invalid. A rope suspended from the rafter over the bed permits him to raise himself; a chair back is provided when he wishes to sit up; a small slate is tacked over the bed to receive any memoranda the physician or nurse may want to make. In short, the baraque is remarkably complete. And yet, when ready for transportation, it weighs, with all its furnishings, only about 2,500 pounds, and has the great advantage of being all in large pieces. There is absolutely nothing to get lost, for everything is fastened securely in place. It is also probable that the baraque will be utilized to some extent by the health authorities of several American cities, in order to provide comfortable temporary hospitals in case of epidemics. It furnishes, indeed, pleasant accommodation for a number of purposes, where shelter of a temporary or semi-permanent character is required. The inventor is to be congratulated for the distinction he has won in the face of European competition and for the material aid he has rendered to those whose mission it is to save life.

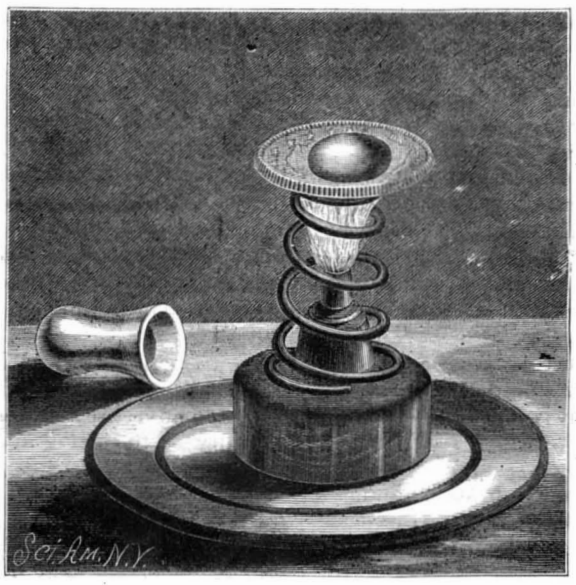
THE SPHEROIDAL STATE OF WATER.

T. O'CONOR SLOANE, PH.D.

Water, when not in contact with anything, or when the force of adhesion is not called into action, generally may be said to assume the spheroidal state. This means that it gathers itself together into a mass approximating more or less closely to the shape of a sphere. In the experiments with lycopodium, illustrated in our last issue, an instance of this was shown where solid globules of water rolled about freely upon a surface strewn with the substance in question, and preserved a shape approximating to that of a sphere. These globules were in the spheroidal state, strictly speaking, but not so in the usual application of the term. It is commonly restricted to those cases in which a high temperature in the immediate vicinity of a mass of water is the proximate cause of its assuming this form.

Every one has noticed that when drops of water fall on a hot range they do not spread out and evaporate, but, instead, form little balls and roll about on the hot metal until they disappear or roll off. The hotter the range, the more perfect is this effect. The experiment illustrated in the cut is the development of this phenomenon.

A cup of bright metal, preferably of considerable thickness, is to be provided. This is most readily made



THE SPHEROIDAL STATE OF WATER.

out of a silver coin, a quarter or half dollar or a silver or trade dollar. The coin is placed over a hole, bored through a solid piece of wood, the hole being of nearly its own diameter. A piece of hard wood, cylindrical, with rounded end, is held with its rounded end upon the coin and driven down by several hard blows with a hammer. This hollows or cups the coin. If a silver dollar is used, it should be hammered until a cup nearly a quarter of an inch deep is formed. A quarter dollar will answer if an eighth of an inch in depth.

A support has now to be provided, and this is readily made out of wire. In the cut a helix of somewhat heavy wire acts as standard. For heat, an alcohol lamp may be used, and it is for such that the spiral support is especially adapted. But there is no necessity for an alcohol flame. A common gas flame will do perfectly. In this case the cup can be held in a cleft piece of wood, which will last some time before it is completely destroyed by the heat. The arrangement shown is very neat. The spiral is made of such size as to fit snugly around the neck of the lamp, and is open enough not to seriously interfere with the flame.

When all has been thus arranged, the lamp is lighted. After a few minutes' burning the wire will frequently begin to show a red heat in its upper coil. But before this occurs the cup may be considered ready. A little water must be poured into it, a teaspoon being a convenient implement for this purpose. Instead of at once beginning to boil, as might have been expected, the fluid collects into an oblate spheroid, and, rolling about from side to side, lies upon the hot surface without a sign of boiling. As long as the lamp is lighted this continues, except that the globule grows smaller and smaller, and after a considerable interval disappears.

However familiar with the phenomenon, it is difficult to avoid the impression that the lamp is at fault, and that the coin is not hot enough to evaporate the water faster. But this is corrected by observing the anomalous form that the water assumes, and by the second phase of the experiment, that shows itself when the lamp is extinguished. The cup is to be made quite hot, and a large globule of water introduced, and the lamp extinguished. For some time nothing new is seen. The globule rolls about restlessly from side to side as before, until the heat falls sufficiently, when it suddenly loses its shape or collapses, fills the cup, and bursts into violent ebullition. If all is rightly proportioned, it will boil away completely, leaving the cup dry. In other words, the cup will not boil water until it becomes cool.

The explanation is not so simple as it was formerly considered. It was in the older textbooks asserted that the water rested on a cushion of steam, and so did not come in contact with the metal. This is measurably true, but the present theory is a modification of this, and asserts that it rests on a "Crookes' layer" of steam—a layer whose molecules beat back and forth from metal to water, and so prevent them from touching each other. It is known that they do not touch, as light can be seen under the globule when a flat plate is used in place of a cup. But if a mere steam cushion were the separating agent, it would not be clear why it is not squeezed out, requiring more and more steam to replace it, so as to exact a most rapid evaporation of the drop, instead of the slow one that actually takes place. The Crookes' layer, with the disposition of the component molecules to vibrate or oscillate in straight lines, does away with much of the difficulty.

The peculiar condition of water has often been invoked to explain boiler explosions. The assumption was, that in such cases the water by excessive heat was kept from contact with some of the plates until the heat fell enough for contact to be established, when the rapid evolution of more steam was supposed to effect the explosion. If, however, the relative weight of a boiler and the water contained are considered, as well as the high specific heat of water and the low specific heat of iron, the explanation will appear a very poor one.

Many other substances can be brought into this state, water being by no means the only one. Even solids rapidly subliming may form and rest upon a similar protective Crookes' layer. Thus solidified, carbonic acid gas may be held in the hand or in the mouth without injury, because there is no contact. If by pressure such contact is established, a severe "burn" is produced by the intense cold. The solid is continually evolving carbonic acid gas, that maintains a Crookes' layer and prevents it from touching the skin.

By use of a powerful lamp and larger cup, considerable amounts of water may be thus treated, and the experiment performed with increased effect. In such cases, a very peculiar phase is the increasing violence of the final ebullition. If the cup is of heavy metal, the boiling that begins slowly grows more and more violent, until the water is exhausted, or nearly so, producing a regularly increasing or crescendo sound. The general proportions given by the coin cup described may be followed in making larger ones, and copper may be used instead of silver, with good results.

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For a Rust Joint.

For making a rust joint that will bear heat, cold, and rough usage, the following formula has been highly recommended: Ten parts iron filings, three parts chloride of lime, and enough water to make into paste. Put the mixture in between the pieces to be joined and bolt them together, leaving until dry. After twelve hours the cement has been known to break off the solid iron.

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Correspondence.

Machine for Sawing Rails.

To the Editor of the Scientific American:

I notice in a recent number of the *Railway Register* an article on the rail mill at Greenbush, N. Y. We have had one at Grand Island since 1879, also run by an eighty horse power engine at the rate of 3,000 revolutions per minute.

The saw is forty in. in diameter, five-sixteenths inch thick, made of Bessemer steel, with a smooth edge.

Two one-half inch pipes keep a constant current of water on it, notwithstanding which the rail for one-eighth inch in front of the edge is made red hot by friction.

The saw was made for iron rails, which it cuts in from twenty to forty-five seconds. It has been tried on steel rails, though it did not work. It is believed by the present general foreman, B. C. Howard, that the reason is that the feed is too fast, and he intends to demonstrate by a series of experiments whether or not steel rails can be cut by it. A CONSTANT READER.

Grand Island, June 10, 1886.

How to Clean a Farm Horse.

One of the most important things to be observed in the management of farm horses is their cleaning, and yet it may be safely stated that nothing is more neglected by the majority of farmers. The horse should never be cleaned or harnessed while it is eating breakfast. Let horses eat their food in peace, for many, from sanguine temperament or greed, bolt their oats when handled during the time of feeding. Harness can be quickly enough put on after the feed is eaten, and time should then be taken to comb the mane and tail and use a wisp of straw on the body and legs. When the horses come in at dinner time, they should at once be *unharnessed*. The feed is then to be given, and before the harness is again put on, the horse should be thoroughly rubbed down with a wisp of straw or hay. If the horses are very warm on coming in, they should be rubbed down immediately after the removal of the harness.

The cleaning or grooming, which should be done at night, consists first in currying the horse with the currycomb to free him of the dirt adhering to the hair, and which, being now dry, is easily removed. A wisping of straw removes the roughest of the dirt loosened by the currycomb. The legs ought to be thoroughly wisped, not only to make them clean, but to dry up any moisture that may have been left in the evening; and at this time the feet should be picked clean by the foot picker—*i. e.*, an iron instrument made for the purpose—of any dirt adhering between the shoe and the foot. The brush is then to be used to remove the remaining and finer portions of dust from the hair, which is cleared from the brush by a few rasps along the currycomb. This wisping and brushing, if done with some force and dexterity, with a combing of the tail and mane, should render the horse pretty clean, but there are more ways of grooming a horse than one, as may be witnessed by the careless and skimming way in which many hired hands do it. The skin of the farm horse should at all times be *clean* if not *sleek*, and a slap of the hand upon the horse will show if there is loose dust in the hair. The currycomb should not be used below the knees, as it is apt to cause injury. For cleaning the legs and feet, nothing is better than the water brush; and when fitting a horse for the show-yard, it may also be used on the body with water, or even a little kerosene, but the latter is not required for common cleanliness, but merely to impart a temporary gloss.

How many farmers can say that their horses are cleaned as thoroughly as we have advised in the above? How much longer would horses live, work, and remain healthy if the above suggestions were put into practice? These are questions which it will be well to consider and answer at leisure.—*Farmer's Review.*

Treatment of Acute Rheumatism.

The last number of the *Russkaya Meditsina* contains a communication from Dr. L. Grinevitski, of Rostoff-on-the-Don, who writes that for more than twenty years he has treated acute articular rheumatism with nitrate of potash, two drachms being given daily in raspberry sirup, and a dose administered every two hours. Together with this internal medication he prescribes an ointment for use morning and evening of the following composition: Olei hyosc., 1 oz.; ung. hydrarg. cinerei, 2 dr.; ext. acon., 1 dr. He has tried all ordinary remedies, and finds that on the whole this plan of treatment is more satisfactory than any other, being especially valuable in those cases where salicylates fail to give relief. Generally the disease is brought to an end in from one to two weeks, according to its severity and the time the treatment was commenced. When commenced at the onset of the attack, and before more than one joint was affected, the others were usually spared altogether.—*Lancet.*

A Photographic Railway Car.

Mr. F. J. Haynes gives the following account of his new car in a recent number of the *Photographic Times:*

This car is built after the latest pattern of Pullman cars, 66 feet long, 12 wheels, air brake, air signal, and all the other improvements. The observation end consists of two large plate glass windows, and glass door running nearly to the floor. This room is used as a reception room. It is 8 ft. 6 in. by 16 ft., carpeted and furnished as a parlor, the panels between the windows being used for the display of specimens. Electric bells connect this room with the culinary department and dark room, and by a series of calls the assistant operator knows when making a sitting all about the plate, size, etc. A stationary desk occupies one corner, while a wardrobe with similar exterior finish fills the other. Mirrors, to give distance, abound in every suitable place.

The toilet rooms and a section consisting of a double upper and lower berth occupy the next eight feet of the car. Of course, all are familiar with sleeping cars, and know that when the berth is "made up" there is nothing to indicate its use. The seats make a convenient place for friends to occupy. The operating room is 24 ft. long, and with short-focus instruments we have sufficient distance for standing figures on a cabinet.

Owing to the uncertainty of always having the car in the same position, I had the light the same on both sides of the car. The top light is covered with iron shutters to protect it from flying missiles, and when in use does not open up but half. If the car is standing on a north and south track, we are compelled to change the light in the middle of the day, but it is easily controlled. The top light is of ground plate glass; the sides clear. Curtains on spring rollers are at the command of the operator. We have four Seavey grounds and Scovill Manufacturing Co.'s cameras. When the car is in motion, the backgrounds and camera stands are fastened securely to the floor.

In the rear end of the car is the kitchen and porter's room, dark room, runway, and all the necessary sinks, cupboards, etc. The range and heater are in the kitchen, and a six barrel water tank is fastened near the ceiling in this room, which is filled from the outside. As we simply make negatives and proofs in the car, the printing and finishing department is dispensed with.

We finish all work at headquarters in Fargo, mailing the finished pictures to customers. We bill a town the same as any traveling show, and advertise for a certain number of days. The novelty of the thing attracts everybody, and, of course, "artistic photography" is in demand the world over.

The cost of the car was $13,000, with about $2,000 in furniture and accessories, etc. Aside from portraits, I do a large amount of landscape work, chiefly for the Northern Pacific Railroad Company, with a 20 × 24 camera.

Design for the Great Telescope Mounting and Dome of the Lick Observatory.

At a recent meeting of the Royal Astronomical Society, London, Mr. Grubb said: About three months ago the trustees of the Lick Observatory invited me to make a design for the equatorial mounting and dome of the great 36 in. refractor which Mr. Alvan Clark is at present making for them. They mentioned at the same time that a similar invitation had been sent to three other optical firms. In the working out of that design, I found it desirable to make a model. I have endeavored to bring all the required motions of the instrument and of the dome under the control of the observer with as little physical exertion as possible. The object glass will be 36 in. in diameter, and the length of the telescope tube 57 ft.; the dome will be 70 ft. in internal diameter, and 80 ft. external diameter. To carry out my idea, it will be necessary that small water engines should be arranged in connection with the telescope and with the dome. The observer, on entering the building, will pick up a small instrument attached to a rope of insulated wires. It is made to fold like a book, so that it can be put in the observer's pocket. It contains keys, by touching which he will be able to control the motions of the instrument and of the dome without moving from his chair. It is not desirable to give electricity too much to do in an observatory, and I do not propose that it should be used for opening and shutting the valves of the engines directly; that will be done by a mechanism which will be wound up every day by an assistant, and consists of a barrel and four weights. This apparatus will open or close the valves, and it will be set in motion or stopped by electricity.

In the model which I have here, the engines are represented by a piece of clockwork, and the clockwork is controlled by little electro-magnets. The observer, on entering the observatory, would take up the little keyboard, which would be hanging near the door, and by a pressure upon the first key would light up the observatory with electric lights. He would then press another key, which would move the dome, and at the same time open the shutter, which can, by a contrivance under the control of the observer, be anchored to the wall of the observatory, so that when the dome is moved the shutter is pulled open. A third key will move the telescope in R. A., and a fourth will move it in declination. Lastly, we have to get the observer into position to observe. Instead of making him climb into an observing chair, which would require to be 25 ft. high, and would be very heavy to move, there is a key which causes the whole floor to move up or down, so that the observer can be brought up to within a few feet of the level of the eyepiece, and can comfortably sit on a low chair without fear of falling or accident. I am sure that an observer cannot do his best work if he is perched up at a great height above the floor, or if he has to employ any exertion in moving his seat or the instrument. The machinery which would raise the floor of the Lick Observatory would be strong enough to allow a ton and a half of observers to be carried up with it. Such a force might do some damage if the wrong key were touched, and the floor went up while the observer had his eye at the eyepiece. I have, therefore, thought it well to provide against such an accident by hanging a weight near to the eye end of the telescope, which, when it touches the ground, would instantly cut off the water supply, and nothing could happen after that.

The President: It makes one feel quite envious to think of the luxuries to be provided for the astronomer of the future. The most charming part of the contrivance to me is the movement of the floor. The life of an astronomer with a key in his hand, which he only has to touch to make all these movements, seems almost ideal—something that one might dream of, but could not hope to realize.

Mr. Common: I had the pleasure of seeing this model at the Royal Institution, and I rather hoped that it was the actual model of what they were going to have at Mount Hamilton; but I fear that it is not so. I had a letter from Prof. Holden the other day, in which he says: "The glass for this lens is now finished, and we hope that during the early part of 1887 we may see the object glass finished and perhaps delivered in California. Our large dome will undoubtedly be finished during the current year, and we look forward to commencing serious work during the year 1887." I saw in last month's *Century Magazine* that there is a proposal to make what they call a seven-eighths dome. That is a spherical building, or seven-eighths of a sphere, erected round the instrument. The upper hemisphere would correspond to the ordinary observatory dome with its shutters, and the lower three-eighths of the sphere would be furnished on the inside with tiers of steps, so that the observer could always get up to the eye end of the telescope. Everything which contributes to the comfort of the observer and the dispatch of business is of the utmost importance. It doubles the value of the observatory.

The Deepest Boring.

The deepest bore hole in the world is at Schladebach, near Kotschau Station, on the railway between Corbetha and Leipzig, and has been undertaken by the Prussian Government in search for coal. The apparatus used is a diamond drill, down the hollow shaft of which water is forced, rising again to the surface outside the shaft of the drill and inside the tube in which the drill works. By this method cores of about 50 feet in length have been obtained. The average length bored in twenty-four hours is from 20 to 33 feet, but under favorable circumstances as much as 180 feet has been bored in that time. Other deep holes are as follows:

Domnitz, near Wettin	3,287 feet.
Probat-Jesar. Mecklenburg	3,957 "
Sperenberg, near Zossen	4,173 "
Unseburg, near Stassfurt	4,242 "
Lieth-Elmshorn, Holstein	4,390 "
Schladebach	4,515 "

The dimensions of the bore hole at Schladebach are as follows:

Depths from surface.	Each size bore, Feet.	Diameter, Inches.
~~189·6~~	~~189·6~~	~~11·0~~
605·7	416·1	9·0
661·8	56·1	7·3
1,906·5	1,244·7	4·7
2,259·8	353·3	3·6
3,543·4	1,283·6	2·8
4,069·9	526·5	1·97
4,514·6	444·7	1·88

The various strata passed through are as follows:

Soil and sand, about	16 feet.
Clay	66 "
Sandstone (Bunter)	459 "
Anhydrite	59 "
Brine spring	....
Magnesian limestone (Zechstein)	144 "
Gypsum	36 "
Anhydrite	295 "
Marl-slate (Kupfersheifer)	3 "
Sandstone (Rothliegendes)	3,435 "

The bore hole, which in January, 1885, had reached a depth of 4,560 feet, was commenced in June, 1880, but left after a year's work, recommenced at the end of 1882, and is still progressing. The cost up to January, 1885, was about $25,000.

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WOOD WOOL.

For some time past there has been found in the market a very interesting product consisting of extremely thin and slender shavings of wood, that are comparable to paper cut for packing, and that go by the name of "wood wool." This product was first introduced into France as a packing material. It weighs about forty or fifty per cent less than the materials generally used for such a purpose. Its beautiful appearance, its fineness, and its extreme cleanness at once brought it into favor with shippers. It was afterward found that the material was well adapted for the manufacture of mattresses, for bedding for cattle, for the filtration of liquids, and for stuffing horse collars, etc., the most suitable species of wood being selected for each of these purposes. Its elasticity causes it to be considered as the best material for bedding, after horse hair; and it is even preferable to any other substance when it is derived from resinous wood, since it does not then absorb moisture.

In workshops, wood wool is tending to replace cotton waste for cleaning machines, and it has likewise found an application on the rolling stock of railways for lubricating car axles. While it has the same property that cotton waste has of absorbing oil, it costs ten times less than that material.

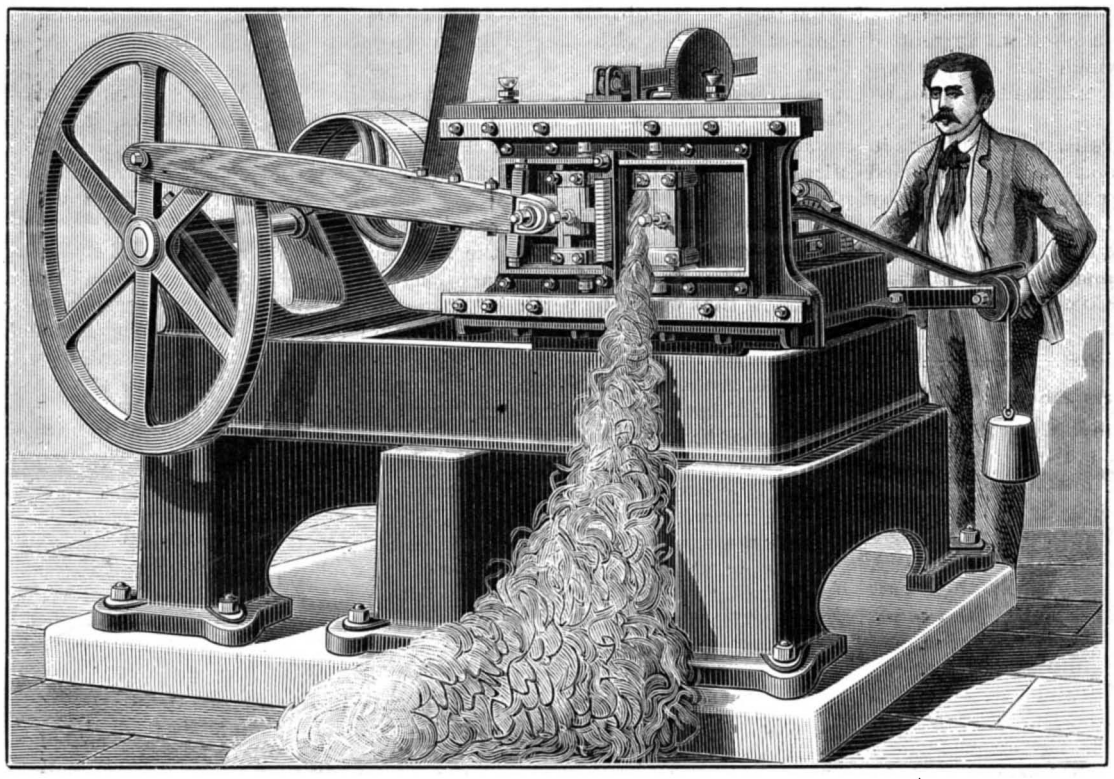
All these advantages explain why the use of it, which is so extensive in America, is rapidly becoming general in Austria and Germany, and is beginning to extend in France.

The accompanying engraving represents a new machine for the manufacture of this interesting product. It consists of a cast iron frame resting upon three supports of the same material, and carrying a driving shaft, which is actuated by two pulleys, fast and loose. To this shaft there is fitted a fly-wheel, one of the spokes of which is provided with a pin that receives one of the extremities of a connecting rod, while the other extremity of the same is connected with the knife carrier. This latter, which also rests upon the iron frame, slides in iron guides, and carries a set of peculiar knives arranged in such a way that the wood is cut in both the backward and forward motions of the knife carrier.

The wood is held upright on the machine by a lever with a counterpoise, and on the sides by a stop at one side and a movable jaw at the other, that permits of introducing blocks of a few fractions of an inch in length. The wood is shoved forward under the knives by means of a click, that causes it to advance the requisite distance at every revolution of the fly-wheel.

The wood used by preference in this machine is Riga fir. The blocks of wood must, at a maximum, be 0·465 millimeter in length, 0·4 millimeter in width, and 0·32 millimeter in thickness, and consequently the most economical and practical thing to do is to purchase commercial fir planks (which are 0·32 millimeter in width and 0·08 in thickness) and cut them to the desired length of 0·465 millimeter. In this way it becomes possible to operate upon four superposed pieces of wood at once.

It takes a power of about four horses to actuate this machine. The production may reach 1,500 or 1,700 pounds of "wool" per day of ten hours. It is unnecessary to have a special workman to run the machine; any intelligent man can operate it.—*La Nature.*



MACHINE FOR MAKING WOOD WOOL.

PRISMATIC GUNPOWDER.

From the statements recently made in the House of Commons during the debate on the navy estimates, when the Parliamentary Secretary stated that the Nile and Trafalgar would probably be the last heavily armored ships of their class, it would appear that the long contest between guns and armor has resulted in a victory for the aggressive force. To what extent this is due to the weapons themselves, and how far to the powder and projectiles used, it would be hard to determine, but certainly the explosive deserves a large share of the glory of the victory.

The advances made within the last two or three years in the manufacture of gunpowder for heavy ordnance have been very great, and these advances have been due in a great measure to the development of more perfect mechanical devices for the necessary processes.

The hydraulic plant for making prisms necessitates a considerable outlay, which private manufacturers in England were reluctant to incur, until the form of powder likely to be required was definitely settled by the Government authorities. In the mean time the resources of the Royal Gunpowder Factory at Waltham Abbey were insufficient to meet the demands of the War Department for prismatic "cocoa" powder, and private manufacturers in England not having the necessary appliances for its manufacture, large contracts were entered into with German manufacturers.

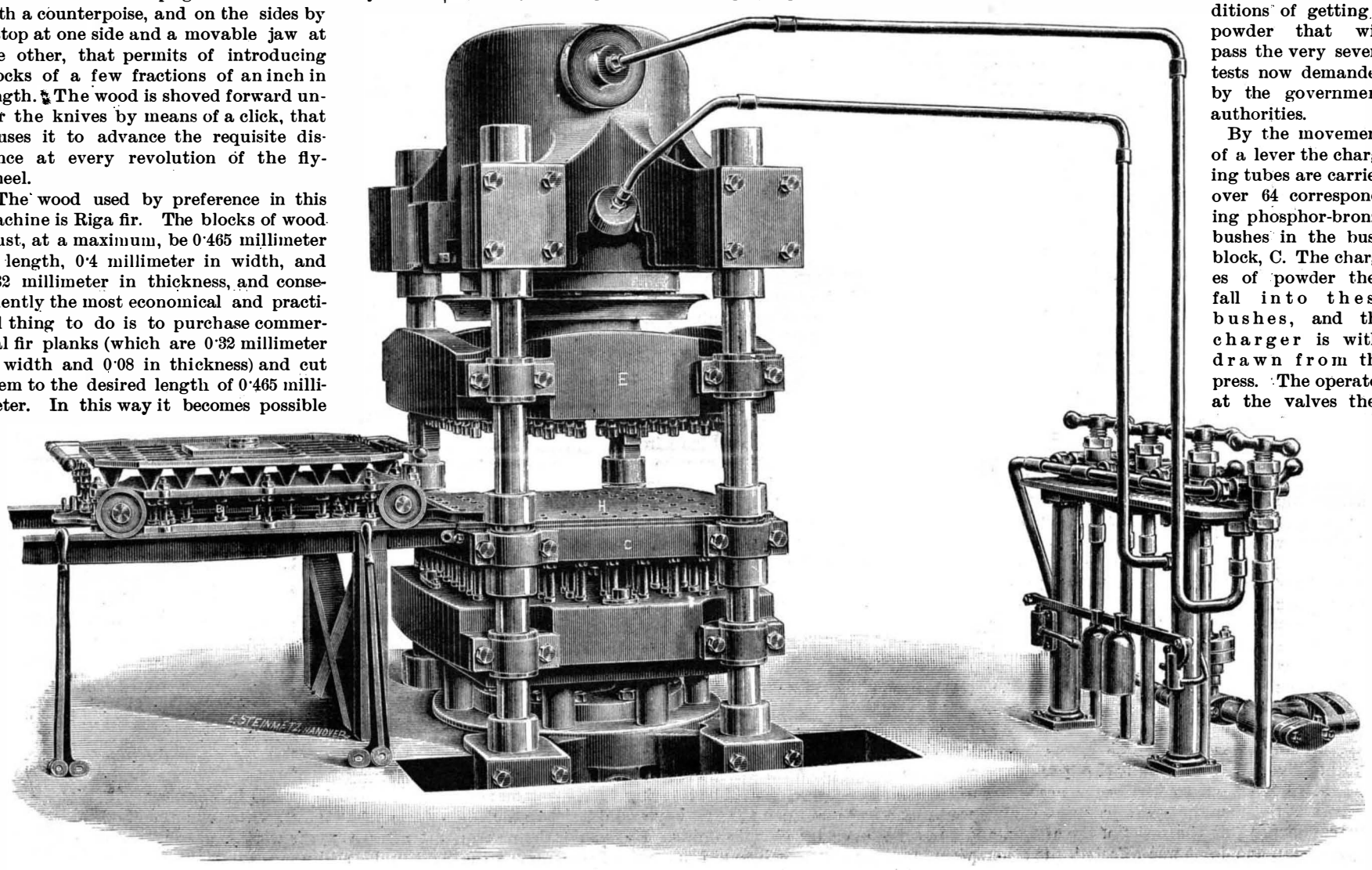
In the mean time, one of our leading firms engaged in gunpowder manufacture had been experimenting with a new form of prismatic powder, and having brought their researches to a satisfactory conclusion, decided to erect a thoroughly efficient plant of the most approved description, in order to manufacture what is now officially known as "Brown X prismatic gunpowder."

The result is the hydraulic press which we illustrate, and which Messrs Taylor & Challen have recently completed, to the order of Messrs. Curtis & Harvey. This eminent firm of gunpowder manufacturers have works at Hounslow, Bedfont, and Tunbridge, and also in Scotland and in South Wales. It was at the Tunbridge works that the new plant was erected, and it was there that we had an opportunity lately of seeing it in operation.

The accumulator is weighted with cast iron segments, which may readily be put on or removed should the pressure require to be varied. When fully weighted, the pressure is 1,050 lb. per square inch.

Three men are required to work each machine, one to manipulate the valves and two to attend to the charger and remove the prisms of powder as they are produced. The operations are as follows: The various conical hoppers, A, which are contained in the carriage of the charger shown on the left of the engraving, are filled with loose grain powder. The charger is then run forward into the press and locked there. By the movement of two levers, which are shown in position in our engraving, the powder is made to fall from the hoppers into the charging tubes, B, 64 in number. These are set to hold the required quantity of powder, and great care has to be taken to fill them completely, as exact uniformity is one of the most necessary conditions of getting a powder that will pass the very severe tests now demanded by the government authorities.

By the movement of a lever the charging tubes are carried over 64 corresponding phosphor-bronze bushes in the bush block, C. The charges of powder then fall into these bushes, and the charger is withdrawn from the press. The operator at the valves then



PRESS FOR THE MANUFACTURE OF PRISMATIC GUNPOWDER.

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allows water at pressure to flow in above the top ram, which forces down the plunger block. Attached to this are 64 phosphor-bronze hexagonal plungers; these enter the bushes, which they fit with great accuracy. At the same time that the top ram is brought down the bottom ram are caused to ascend. To the latter is attached the plunger block, E, to which are attached 64 hexagonal plungers, that also correspond to and accurately fit the bushes in the bush block. In this way the charges of powder contained in the bushes are pressed between the plungers. Under ordinary conditions of atmosphere, the pressure is kept on for about ten to twenty seconds, the time varying with the different descriptions of powder.

The top plungers are then lifted, and the lower plungers are raised to eject the prisms from the bushes. The prisms are pushed off, clear of the press, on to a wooden tray, to be removed by an attendant. The bottom ram is lowered again into its first position, and the charger is run into the press again ready for the next operation. In this way each machine will make 64 prisms every two minutes. It is necessary, however, that each prism should have a hole through its center in a line with its axis.

These holes are formed in the following manner: The bottom plungers have holes bored through, which are of the same diameter as the holes required in the prisms. This allows a number of phosphor-bronze rods, one to each prism, to pass through the plungers and then through the powder in each bush. These rods stand nearly level with the top of the bush block, and are firmly held by the plate, H, so that the prisms are pressed with these rods in the middle. When the prisms are ejected from the bushes, they are stripped from the rods. It is indispensable that all the prisms produced should be of exactly one size, and should contain precisely similar quantities of powder. Their uniformity is tested by means of immersing them in a bath of mercury, the readings being taken off on a very accurately marked scale. In working the machines, a separate valve is used for each operation, and an ingenious automatic arrangement has been devised to prevent the attendant turning a wrong valve, so as to bring down the top ram when the charger is in the machine. There is also a safety arrangement to prevent damage to the machine should a pipe burst.

We have referred to the necessity that exists for producing all the prisms of a definite and uniform size and specific gravity, in other words, that there should be exactly the same amount of gunpowder, compressed to the same degree, in each specimen. It is this point that has principally engrossed the attention of the makers of the apparatus, and the result is a beautifully accurate piece of mechanism. It has only been by the greatest care in finishing to gauge and in the adjustment of parts that the success undoubtedly achieved by this machinery has been attained. The tests of powder, such as this, now required by the War Office are of the most severe description, as may be gathered from the following details, which represent some of the principal points in the official specification of tests.

Size of Prisms.—The prisms to be of the following dimensions: height, 24·8 ± 0·2 millimeter; diameter (over sides) 34·7 millimeters ± 0·2 millimeter. The hole to be 10 millimeters in diameter. The prisms to be gauged as follows: 219 prisms should fit easily in a metal frame 705 millimeters long, 352 millimeters wide, and 25·3 millimeters high, and should offer no resistance to a straight edge drawn over the top of the frame.

Density.—The absolute density of the finished powder must not be less than 1·80.

Moisture.—The finished powder must not contain more than 2·2 per cent nor less than 1·7 per cent.

Velocity.—A charge of 295 lb. of powder in the 12 in. beeech-loading gun (of a gravimetric density of $\left(\frac{33{\cdot}2}{0{\cdot}835}\right)$ shall give a mean muzzle velocity for the five rounds of not less than 1,900 ft. per second nor more than 1,940 ft. per second, to a proof cylinder having a total weight of 714 lb. The mean of the deviations of the muzzle velocities of the several rounds, from the mean velocity of the five rounds, shall not exceed 10 ft.

Pressure.—The mean pressure indicated on firing, as above, by the compression of copper cylinders, adjusted in crusher gauges, is not to be greater in any one round than 16½ tons on the square inch, and the mean of all the pressures shall not exceed 16 tons.

These very stringent tests are perhaps the best comment we could have on the great strides the art of making explosives has made within the last few years. It is not so very long since—well, within the memory of living powder makers—that gunpowder was gunpowder, without any very striking difference for whatever purpose it might be required. The "velocity" tests show a wonderful departure from those simple times; and although the restrictions laid down in this respect may seem unnecessarily severe, and even arbitrary at first glance, on further inquiry we believe there will be found to be sound reason at the bottom of them, and it is only by their strict observance that the accurate practice necessary in modern warfare can be insured. We are glad to learn, therefore, that Messrs. Curtis & Harvey, as English makers, have in the "Brown X prismatic" produced a powder that has passed the government examination, and fulfilled thetests enumerated to the fullest extent, and that British guns can in future be fired with British powder.—*Engineering.*

THE WATER BUCK.

THE WATER BUCK.

The collection of animals at Central Park has recently been enriched by the addition of the water buck (*Kobus ellipsiprymnus*). This specimen, the first that has been brought to this country, is associated in a group of water-loving antelopes with the leche (K. leche), the pookoo (K. vardoni), and the nsunnu (K. lucotis). The horns of these closely allied African species are of good size, only present in the males, transversely wrinkled, curved forward and a little inward at the tips.

The water buck and the sing sing antelopes are much alike, the latter wanting a white elliptical patch which is found near the base of the tail in the former. At the shoulders they stand four feet six inches, and the pale horns are two and a half feet long. The body color is a brownish gray, with lighter marking about the eyes and neck.

These animals frequent the lakes and marshes of eastern Africa. They are excellent swimmers, and probably have just the same habit as the moose, of walking upon the bottom of a pool or stream with little else than their nostrils protruded above the surface. The water antelope, says Mr. Drummond, is an extremely fine animal, and so plentiful that there are probably more of them shot than of any other of the large antelopes. The large ringed horns which in the males crown the brow bear a strong resemblance to those of the reed buck (reitbok), while the habits and general appearance of both species are almost identical. Both frequent thickets and reedy places near the water, and are principally found in pairs or in small groups.

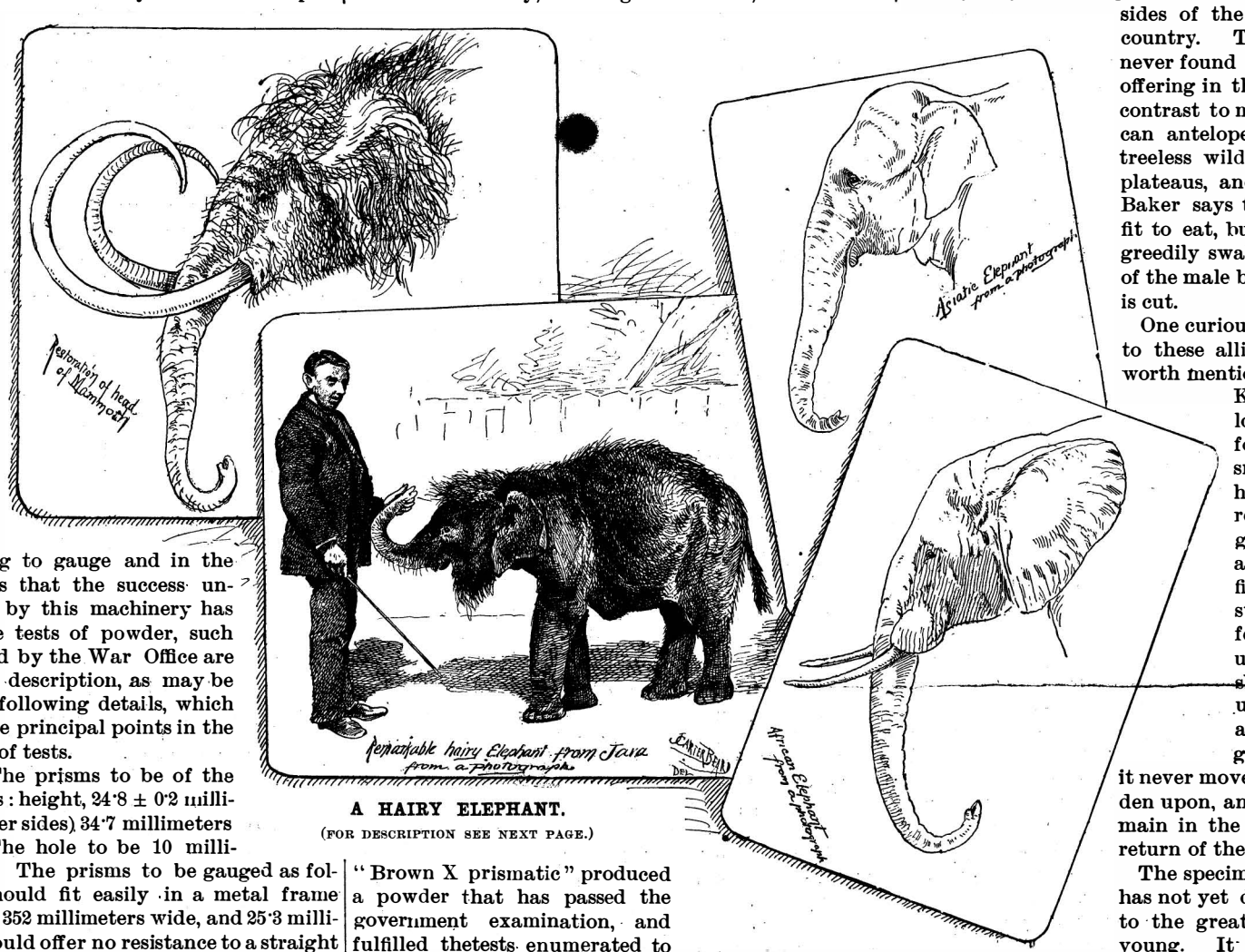
The hair of the species of water buck inhabiting eastern Africa is very long and coarse, while that of the one found in central Africa, the sing sing, is remarkably soft, and highly prized by the natives as being so. In fact, the hair on the neck of the specimen now at Central Park is long enough to produce quite a mane. The name kring-gaat, given to this species by the Dutch, has reference to the white ring about the rump. Its range is extensive, from eastern, through central, Africa up to Abyssinia, where it is called the mehedihet.

It is said to climb well in spite of its rather heavy build, and at times herds of from a dozen or less up to twenty may be seen speeding, like goats, up the steep sides of the rocky hills of the country. They are, however, never found far from the water, offering in this respect a curious contrast to many species of African antelopes who inhabit the treeless wilderness of the arid plateaus, and never see water. Baker says the flesh is scarcely fit to eat, but that the natives greedily swallow the hot blood of the male buck when its throat is cut.

One curious habit is attributed to these allied species which is worth mention. It is said by De Kirk that the antelopes are generally found feeding in small herds. In the heat of the day it rests in the long grass, and may be approached within fifty yards before starting. Should the female have young unable to run far, she places her foot upon its shoulder, and presses it to the ground, after which it never moves until almost trodden upon, and is expected to remain in the same spot until the return of the mother.

The specimen at Central Park has not yet developed its horns to the greatest size, and is still young. It bears confinement well, and suggests easy domestication. The comparatively poor quality of its flesh and the coarseness of its hairy coat would, however, render it useless for any economic purpose.

It seems somewhat strange that Africa should have developed such an extraordinary variety and number of species of antelopes, when the great western continent can produce but a single species (the pronghorn), but no more singular, perhaps, than that no species of bear is found in the former country.


Restoration of head of Mammoth
Remarkable hairy Elephant from Java from a photograph
Asiatic Elephant from a photograph
African Elephant from a photograph

A HAIRY ELEPHANT.

(FOR DESCRIPTION SEE NEXT PAGE.)

REFERRING to baseball, which seems to rage like an epidemic this season, has induced the suggestion that the average man in a large city must have an easy time, plenty of means, and limited hours of employment, when 8,000 can devote three afternoons each week to watching eighteen full-grown men toss a ball around a field.

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A HAIRY ELEPHANT.

Some time since the attention of scientific men, and especially of naturalists, was directed to a couple of very extraordinary elephants imported from Sumatra. One of these creatures, although full grown, was no larger than a goat; and the other, here illustrated by a drawing from a photograph, though larger, was still more noticeable on account of the singular approximation exhibited in shape and general appearance to the extinct elephant or mammoth (*Elephas primigenius*), the resemblance being still further enhanced by a heavy growth of rusty brown and black hair. This hair, as shown in the illustration, is thickest on the chin, head, and along the back, on which it forms a sort of mane. The lowness of the forehead, the peculiar situation of the eye and ear, the abrupt falling off at the hinder quarter, are features peculiar to this creature among living elephants, and irresistibly remind one of the restorations of the mammoth given in encyclopedias and text-books.

In order to show this more clearly, drawings of the heads of the two living species, the Asiatic and African, together with that of the restored extinct Siberian elephant, are given. As is well known, this last species has been found in Siberia in a frozen state, beautifully preserved, with the hair and tissues in so excellent a condition that microscopical sections have been made of them, and these two agree in appearance and character in a very remarkable manner with those of the animal represented. Can it be that this is an instance of what is called by Huxley "breeding back," or is it only a sport of nature, one of those experimental varieties occasionally thrown off from the parent stock, that are, according to the development theory, the origin of new species? In either case it comprises a state and collection of facts that involve questions for discussion and decision of the greatest possible interest to naturalists. Nor is the likeness this animal bears to the Siberian mammoth one based upon a merely supposititious restoration, for these extinct elephants are discovered from time to time in as excellent a state of preservation as if they had recently died. No less than four such animals have been discovered since the beginning of this century, the last one as late as eighteen hundred and forty-six. A young Russian engineer, Benkendorf by name, who was employed by the government in a survey of the coast of the mouth of the Lena and Indigirka, was dispatched up the latter stream in the year mentioned, in command of a small iron steam cutter. He writes the following account to a friend in Germany: "In 1846, there was a most unusual term of warm weather in Northern Siberia. Already, in May, exceptionally heavy rains poured over the moors and bogs, storms shook the earth, and the streams carried not only ice to the sea, but large tracts of land thawed by the masses of warm water furnished by the southern rains."

After an eight days' journey, meeting many hinderances and perils from the ice floods and drifts, Benkendorf and his companions reached a place called Ujandina. Here they found the river had torn itself a new channel, leaving in its former bed only an insignificant stream. "Afterward," he says, "we landed on the new shore, where we made a wonderful discovery. The stream tore up the soft, wet ground like chaff, so that it was dangerous to go near the brink. Suddenly our hunter, always vigilant, called loudly and pointed to a strange, misshapen object, which rose and sank in the boiling turbulence of the waters. I had seen it before, but had not noticed it particularly, considering it only driftwood. Now we all hastened to the spot on the shore, had the boat drawn near, and waited until the mysterious thing should again show itself. Our patience was tried, but at last a black, horrible, giant-like mass was thrust out of the water, and we beheld a colossal elephant's head, armed with mighty tusks, with its long trunk moving in the water in an unearthly manner, as though seeking for something lost therein.

"Breathless with astonishment, I beheld the monster only twelve feet from me, with his half-opened eyes yet showing the whites. . . . Picture to yourself an elephant with a body covered with thick fur, an elephant thirteen feet high and fifteen feet in length, with tusks eight feet long, thick, and curving outward. The animal was fat and well grown; death had overtaken him in the fullness of his powers. His great ears lay fearfully turned up on his head. About the shoulders and back he had stiff hair, about a foot in length, like a mane. The long, outer hair was deep brown and coarsely root[illegible] The top of the head looked so wild, and was so penetrated with pitch, that it looked like the rough bark of an old oak tree. On the sides it was cleaner, and under the outer hair there appeared everywhere a wool very soft, warm, and thick, and of a yellow-brown color. The giant was well protected against the cold. The whole appearance of the animal was fearfully wild and strange. It had not the appearance of our present elephants. It head was rough, the brain case low, but the trunk and mouth were much larger. The teeth were very powerful. I could not divest myself of a feeling of fear as I approached the head; the broken, widely opened eyes gave the animal an appearance of life, as though at any moment it might start up, and with a ferocious roar destroy us."

Much in this graphic description, making allowances for the comparatively pygmy proportions of the Sumatra elephant, reminds one of its appearance. It is nevertheless a very intelligent animal, and has been taught many tricks, among which may be adduced that of riding on a velocipede and walking a tight rope. It was lately in the possession of Mr. Reiche, the celebrated importer of wild animals, and the photograph from which the illustration appended was copied, was taken on his private grounds at Hoboken, New Jersey.

Fire Escapes.

After each large fire wherein the inmates of buildings, being cut off from egress, meet with fatal results, there is a general cry for a more rigid enforcement of the law compelling owners of large blocks and hotels and workshops to erect suitable fire escapes. Now, the question arises, What constitutes a suitable fire escape? In the first place, I would like to argue *pro* and *con.* regarding the fire escape that is generally used now—a common iron ladder bolted either to the front or side of a building, as an example we will say a hotel. Now, in case of a fire, this is all that is desired to save a man's life under certain conditions; that is, provided a man is a sailor, used to climbing, and also that he sleeps in the same room that the ladder reaches. But with circumstances other than these, a ladder is a mere mockery, for the following reasons: It is never to be supposed that one woman or child in a hundred would have presence of mind enough to first find and then descend a ladder. Again, the persons whose rooms the ladder reaches, upon retiring lock and bolt their doors, and very likely in case of fire will quickly descend the ladder, leaving those whose rooms are not so favorably situated to escape as best they can. I have never yet learned where a stationary ladder was the means of saving human life.

The Milwaukee hotel fire, a few years ago, gives us a good example of the inefficiency of the stationary ladders upon that building. Nearly all the inmates were so excited that they could not act for themselves, but even those who would do so were driven back by the dense smoke, and in order to keep from suffocating were obliged to stay at the windows, and as a result were slowly burned to death. At a recent fire chiefs' convention, the opinion was given that a fire escape that depended upon the inmates of buildings for action was practically useless.

What is needed is an escape that is manipulated by persons on the ground—one that can be raised, lowered, and moved to any window in the building, and rescue three or four men, women, or children at one time. There are patent fire escapes innumerable, some embracing ideas that are without doubt very ingenious, but they all contain this one great fault, they are not handled by persons on the ground. Again, architects and builders should take into consideration the fact that fire escapes, as they are now made, are not an enhancement to the good appearance of buildings.—*F. C. B., Amer. Builder.*

Excavations at Pompeii.

A correspondent writes as follows to the *N. Y. Journal of Commerce:*

It seems odd to speak of a dead city as a growing one. But that is exactly the case with Pompeii. There are many cities in Italy that do not grow half as fast as the one buried by the ashes of Vesuvius 1,800 years ago. A person visiting it at intervals of a year notices a marked enlargement of its boundaries. The Italians, you know, are the champion diggers. They make the shovel fly when they attack the grave of Pompeii. We saw a gang of them at work there. A Government overseer watched them like a hawk. He wanted to be sure that they pocketed no jewelry, coins, or objects of art or utility yielded by the excavations. The only produce of their toil in that line as we stood by was a bit of iron, which the guide called a hinge, and the fragment of a small marble column. The spades busily plied were gradually bringing to light a beautiful house. The floors were mosaic, with simple but graceful designs in scroll pattern—nearly as fresh of color as if laid yesterday. The walls bore frescoes of fainter tints—grinning masks, fawns, cupids, birds, fish, and fruit. It had evidently been the home of a well-to-do citizen of Pompeii. The nervous movements of the workmen betrayed their anxiety. They were hoping at every moment to make a valuable "find." Perhaps they might hit upon a great iron chest, studded with round knobs like a boiler, and full of gold, money, or ornaments, or they might strike another wonder in marble or bronze, or they might be startled by coming suddenly upon a skull or other human remains. In the latter event, the work is suspended till a careful inspection is made.

The responsible and intelligent person in charge proceeds to ascertain if the dead Pompeiian has left a mould of himself or herself in the plastic ashes. If so, he prepares a mixture of plaster of Paris, breaks a hole in the crust, and slowly pours in the liquid till the mould is full. When it has hardened, the casting is tenderly removed. Lo! there is a rough image, showing some poor creature in the agonies of death, prone on the floor, face downward.

Thus, most usually, were the inhabitants of the doomed city caught by the destroying angel. The skull, or leg, or arm, or whatever other part of the skeleton has not relapsed into its original dust, may attach itself to the plaster cast in the proper place, or may require to be joined on by a pardonable "restoration." In either case, the effect is thrilling in its horrible reality. Nothing in painting or sculpture can shock the beholder more than these self-produced and truthful statues exhibited in the museum, which is the first and most interesting thing shown to visitors. But, though neither gold nor silver, nor the minutest scrap of a skeleton, nor anything else of importance was unearthed for my benefit, I quitted the new excavations with reluctance to examine those parts of Pompeii with which the world is already familiar through the medium of books and pictures. I found myself quite at home in the bakery, the wine shop, at the oil merchant's, at the houses of Pansa, of Sallust, of the "Tragic Poet," and the rest. The high stepping stones across the streets looked familiar, as if I had trodden them before. The deep ruts cut by the carts as they groaned up the hill, coming from the ancient Stabia, were like friendly landmarks. So fully have literature and art made us acquainted with this disinterred city.

The guide tells me that only about one-third of Pompeii has yet been uncovered. I take his word for it. He is also of the opinion that the best parts of the city have already been dug out. He evidently wishes that the work would stop. He is very human in this, for he finds it tiresome to show people about the present Pompeii. Treble its size, and his labor would be threefold. And he is forbidden to accept money. But I imagine that this very stern prohibition does not prevent persons from offering him (say) a couple of francs on "the sly," or him from accepting them.

It may be true, as our guide insists, that the temples, forums, baths, theaters, and fine houses now above ground surpass anything of the kind that may hereafter be discovered at Pompeii. But the Italian Government is not disposed to take that for granted. Liberal sums are yearly appropriated to push on the work. It bears fruits. A new temple or amphitheater may not be struck every year, but something is constantly being turned up to instruct the world in the manners and customs of the old Romans, so well reflected in the representative city of Pompeii. Of bronze or stone statues, household implements, and tools of trades, the yield is immense and steady. These may be counted by the thousand in the splendid museum at Naples. One can see so many articles of luxury and use exactly similar to those he buys nowadays, that he is fain to pause and try to remember what besides the steam engine, the photograph, and the electric telegraph we moderns have invented. There being no more room at Naples to store these treasures, the excess of them is huddled together in the courtyards and houses of Pompeii herself. It is estimated that at the present rate this mine of antiquities will not be worked out in fifty years.

Machinery and its Possibilities.

Those who entertain the opinion that the possibilities of labor saving machinery are nearly exhausted, and that the whole field of art industry in which it may be advantageously employed has been already covered by inventive genius, are greatly mistaken. That the achievements of human ingenuity have been wonderful goes without saying, and there are reasons to believe that future triumphs in this direction will be even greater and more fruitful. We are forced to this conclusion by reason and analogy. Who would have believed, only a very few years ago, that the difficult and complicated processes which are now every day being wrought out by machinery in various branches of manufacture would have been possible? Thus it is that the problems unsolved by one generation become accomplished facts by another. Who shall say that what now seems impossible and improbable may not be successfully attained by those who will come after us? In the hands of the modern scientific inventor, matter becomes almost miraculously endowed with life and intelligence, and with great accuracy performs those functions which the most skilled manual labor executes but slowly and imperfectly.—*Manufacturers' Gazette.*

A MAN in London proposes for a paltry sixpence to furnish a miraculous preparation that will enable any one to turn pennies into sovereigns. The writer recollects in his boyish days that he tried to convert pennies into silver quarters with a solution of nitrate of mercury, and the trouble he experienced was not merely that he could not pass the transmuted coin for 25 cents, but the storekeeper was reluctant to receive it for its true value, one cent.

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ENGINEERING INVENTIONS.

An automatic attachment for locomotives has been patented by Mr. Norman F. Chase, of Montrose, N. Y. This invention supplies a novel construction whereby certain devices upon the locomotive may be operated by a person on the track or at a station to signal the engineer or stop the locomotive.

A car coupling has been patented by Mr. Noble K. Parks, of Pilot Grove, Ind. By this invention the reversible coupling bar is formed at one end with spring clamping jaws and at the other end with an arrow shaped head to adapt it to be reversed in the drawhead, to present either the clamping jaws or the arrow head at the forward open end of the drawhead, as may be required.

A freight car door lock has been patented by Mr. James Abbott, of Elmira, N. Y. A shaft with a squared upper end is journaled in the car roof, rods connecting with the inner end of the shaft extend to the sides of the car, and a hasp is pivoted on the roof of the car, and provided with an aperture for receiving the upper end of the shaft, making a simple and safe lock, to be operated from the roof of the car.

A steam engine has been patented by Mr. James S. McCoy, of Brooklyn, N. Y. The slide valve is carried by and within the piston, around which a steam space is formed in the cylinder, so that the piston is rendered almost entirely frictionless, the steam inlet port to the cylinder being immediately below the piston, whereby the pressure of steam will counteract the weight of the piston, with various other novel features.

MISCELLANEOUS INVENTIONS.

A clay tempering machine has been patented by Mr. Frank Middleton, of Richmond, Va. This invention relates to novel construction of the main frame and to the method of transmitting and applying the power, whereby the mechanism is simplified and greater steadiness of frame and machinery obtained.

A vulcanizable gilding rubber has been patented by Mr. Jehu H. Wood, of Lebanon, O. This invention covers, as a new article of manufacture, a sheet of vulcanizable rubber, to which coatings of chloride of silver have been applied, together with a novel process of applying such coating, more especially for use in making dental plates.

A belt clasp has been patented by Mr. George E. Zeltmacher, of Brooklyn, N. Y. This invention covers a novel device, whereby belts can be readily adjusted to an increased or diminished length, so that they will remain securely in place when adjusted, and the device will not disfigure or otherwise injure the belts.

A cotton gin has been patented by Mr. Franklin H. Lummus, of Brooklyn, N. Y. Connected with the saws and brush cylinder is a combined carding brush and fire extinguisher, having a continuous unbroken surface of bristles, so arranged that draught through or between the bristles is prevented and a fire extinguishing surface is produced.

A shank lasting apparatus has been patented by Mr. Frank B. Beyerle, of New York city. It has jaw arms with pivoted jaws, and links pivotally connecting the ends of the jaw arms to allow relative longitudinal movement, with other novel features, the invention being an improvement on a former patented invention of a similar tool.

An apparatus for manufacturing double film photographic sensitive paper has been patented by Mr. Henry J. Newton, of New York city. The apparatus embraces guiding, tension, and wiping devices, supported in bearings adjustable in reverse directions, to regulate their distances apart upwardly and laterally, for evenly distributing sensitive emulsion on both sides of the paper simultaneously.

An anchor for fence posts has been patented by Mr. Jacob V. Higgins, of near Three Bridges, N. J. The anchor base plate has an aperture to receive an iron fence post, there being an upwardly projecting neck around the rim of the aperture, and this plate is intended to be placed so low that the top of the piece will be below the surface of the ground, in which, being loose on the post, it can work up or down with the action of the frost without tilting the post.

A combined latch and lock has been patented by Mr. Joshua B. Hutson, of Richmond, Va. Combined with the sliding bolt of the lock is a sliding frame, intermediate between the knob nut and key and the bolt of the lock, with means for locking the sliding frame, to prevent it from being moved by the knob nut or key, while permitting the free movement of the bolt, the invention being an improvement on a former patented invention of the same inventor.

NEW BOOKS AND PUBLICATIONS.

PROCEEDINGS OF THE DAVENPORT ACADEMY OF SCIENCES. Vol IV. 1882–1884. Davenport, Iowa: Published by the Academy, 1886.

This fourth volume of the proceedings of the Davenport Academy of Sciences contains a number of papers of permanent scientific value. Mr. J. C. Arthur continues his "Contributions to the Flora of Iowa," which have already attracted favorable notice in previous volumes. Dr. C. C. Parry has a number of botanical papers; and in his chief contribution, "Chorizanthe," he has undertaken a complete revision of the genus, which has been received by botanists generally, and has been adopted at the Royal Herbarium, Kew Gardens, England. The descriptions of new Blastoids and Crinoids from the Hamilton group are accompanied by fine illustrations. But perhaps the chief interest of the volume centers in its archæological contributions. Some of these are of more than usual merit. Dr. Hoffman of the Bureau of Ethnology has an illustrated paper on Aboriginal Art in California and Queen Charlotte's Island. An article on the Ancient Pottery of the Mississippi Valley, by Mr. William H. Holmes, of the U. S. Geological Survey, is accompanied by excellent illustrations drawn by the author, who is a skillful artist as well as archæologist. Mr. Harrison and Mr. Preston have papers respectively on mound explorations in Iowa and Illinois. The Elephant Pipes and Inscribed Tablets in the Museum of the Academy have been carefully described by Mr. C. E. Putnam. There are in addition a number of biographical and miscellaneous papers, which make a total contents very creditable to the Academy.

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Barrel, Keg, Hogshead, Stave Mach'y. See adv. p. 366.

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Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.
References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.
Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.
Scientific American Supplements referred to may be had at the office. Price 10 cents each.
Books referred to promptly supplied on receipt of price.
Minerals sent for examination should be distinctly marked or labeled.

(1) A. H. M. asks: In a dynamo not using batteries or permanent magnets, where is current of electricity generated that makes the field magnets electro magnets? A. In the armature, and thence part or all the current is carried around the field magnets.

(2) L. J. asks about cleaning petroleum pipes. If a powerful magnet be fixed in the scraper, would a compass passed on the outside not indicate the scraper's position? Is the pipe stoneware or iron? A. The pipe is iron. A magnet in the scraper might to a slight extent deflect or affect a poised iron or steel unmagnetized needle. The compass would be useless, as the metal of the pipe would affect it. Two difficulties in connection with any such plan are: 1. The metal pipe would, by distributing the magnetism, act as a magnetic shield, so that it is questionable if any evidence of its presence could be obtained. 2. A strong magnet, by attraction to the sides of the pipe, would help to obstruct the movement.

(3) J. S. M. asks for description of the Jamin magnet, its form and construction, and the quality of steel used. A. Jamin's horseshoe magnets are made of plates of steel magnetized separately and arranged one within the bend of the other, or concentrically. For tempering, etc., consult SUPPLEMENT, Nos. 302 and 318.

(4) D. B., of Ohio.—A State court has no authority to prohibit the use of a patent pending the action in a suit brought thereon, which necessarily involves the question of infringement.

(5) O. J. S. asks (1) if coal gas decreased in bulk one-half will develop double the pressure. A. It will. 2. How many cubic feet of coal gas would be contained in a reservoir 15 inches diameter and 3 feet in length, at a pressure of 200 pounds per square inch? A. 49·2 cubic feet.

TO INVENTORS.

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June 8, 1886,

AND EACH BEARING THAT DATE.

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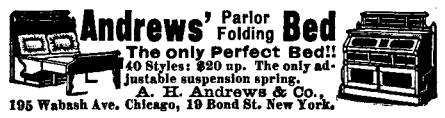
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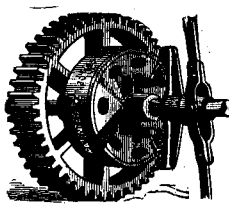
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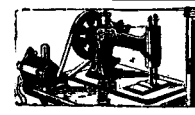
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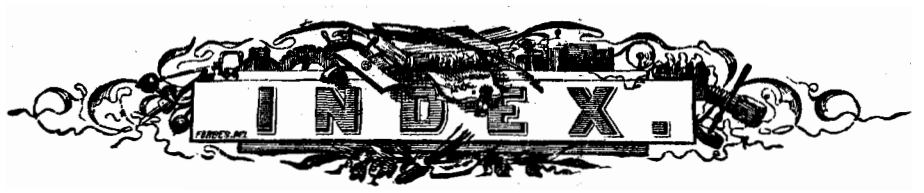

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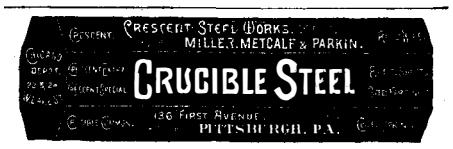

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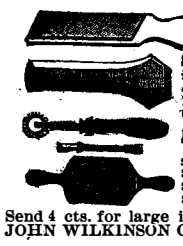

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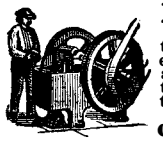

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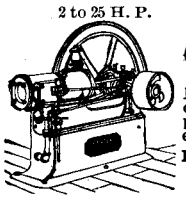

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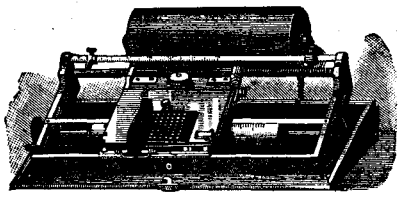

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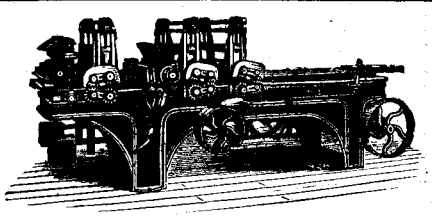

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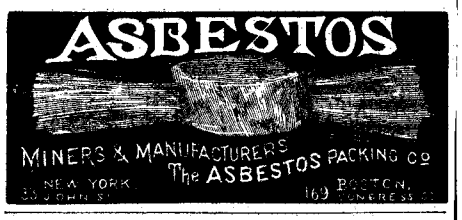

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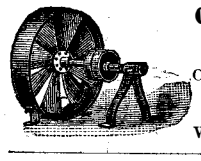

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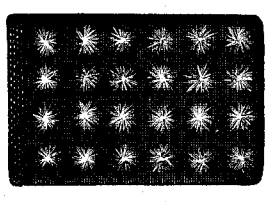

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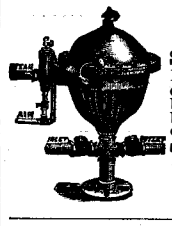

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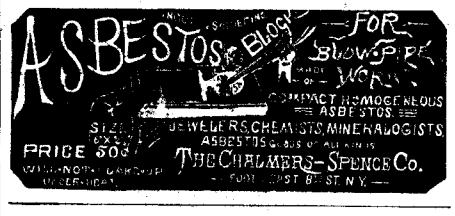

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